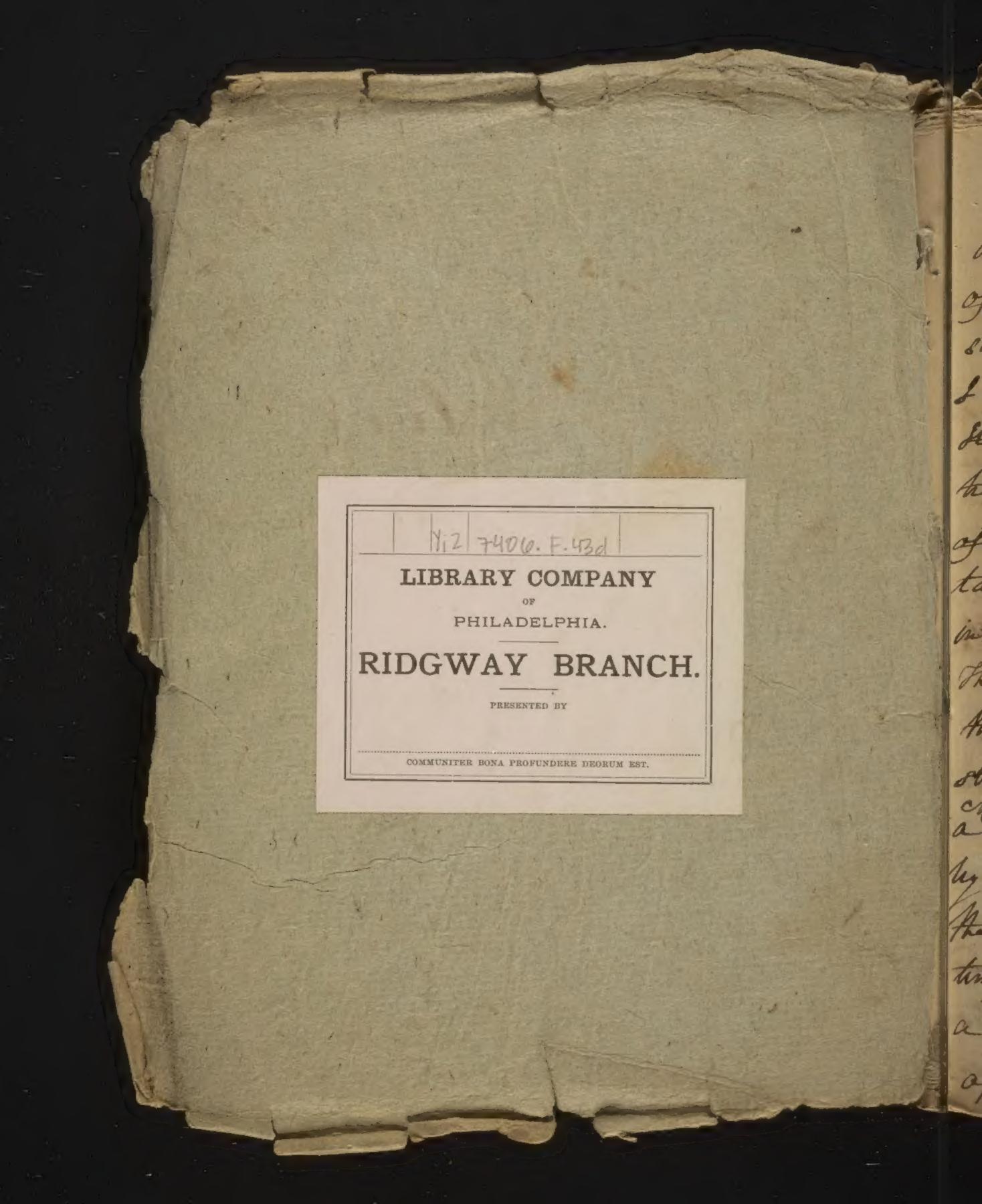
Introductory Pecture...



I nave come before your gentlemen to activer on introductions to the hetway of the late Dr Bujamin Rush, on the m stitutes and practice of medicine, which I shall read during the ensuing winter, It is common on accasions like the present to que a history of the origin and progress of the branches of medical science to be taught and to announce the plan of but bustion soutineplated in them. -The hotuses I will read have a halue that will be best recieved by the intire study of them, and they have long popular a france that sundery any alune ment offerd by the promulgation of their plan, altoge there unnecessary - (hor will I accurate your time with the history of meaisens. Such a history can propose nothing new, and Offer no instruction that has not long!

adoctions to usmons parts of this lecture much has been said by pathalogical by authory of venerous and artiseal conjustions on plethones, The vienes of have guen, will show that a uenaus plethora cannot take place from more rapidly the of circulation, and can only amore from abstruction of the users, or from the contraction = Ce of the universal areas of the arter is - whe Me then the an artiscal plethones can take blace from the exertion of the tonicity of the views, may maguine further observa a weak or strong arction of the heart on or an abstruction of the large trunks of wing to or arteries, cannot atten the flush of blood of Amo the circuit - for since that alistantion at is in the cause of the circle, the abstice

ago income familiar to the youngest student nor would I wellingly hel quetty of tour mackey of your knowledge by repeat ing that which forms the preface to almost every hook in the secimes. - The historical intraductions and theatises son common un our books and between, have always apo presed to the to be the more apolagingon thanghe, the substitution of the warteful am playment of transcribing, for the unful ac: : cupation of refliction and even under the mast myeniaus and aluquent forms in which They can be presented, they seem like the afring up of time only for the purpose of sacrificing it in formant is it est stargelow over their front states and bounder with the act of he can as this during of me are in the so representations of the arrangement oter at the selection of war to reason that we to Espation for a fine of opinion server and

Since (the heart) from which any pletone are of the atistruction should be complete no more aura Cauli be sout an from the heart than the 1000 contact of the vintricle, If the obstruction be partials there, the bland will only take on a velocity investly proportion as to that aiminution of area - The phenomena afforded by a bystune around a linear offend no proof of conjection lessing place from the obstruction of the laye brunks, for here 9 the heart continues to be supplied from other sources, and can then fore purnish ah two to the arliveir for the conjustion in the no no argument against the power of the heart

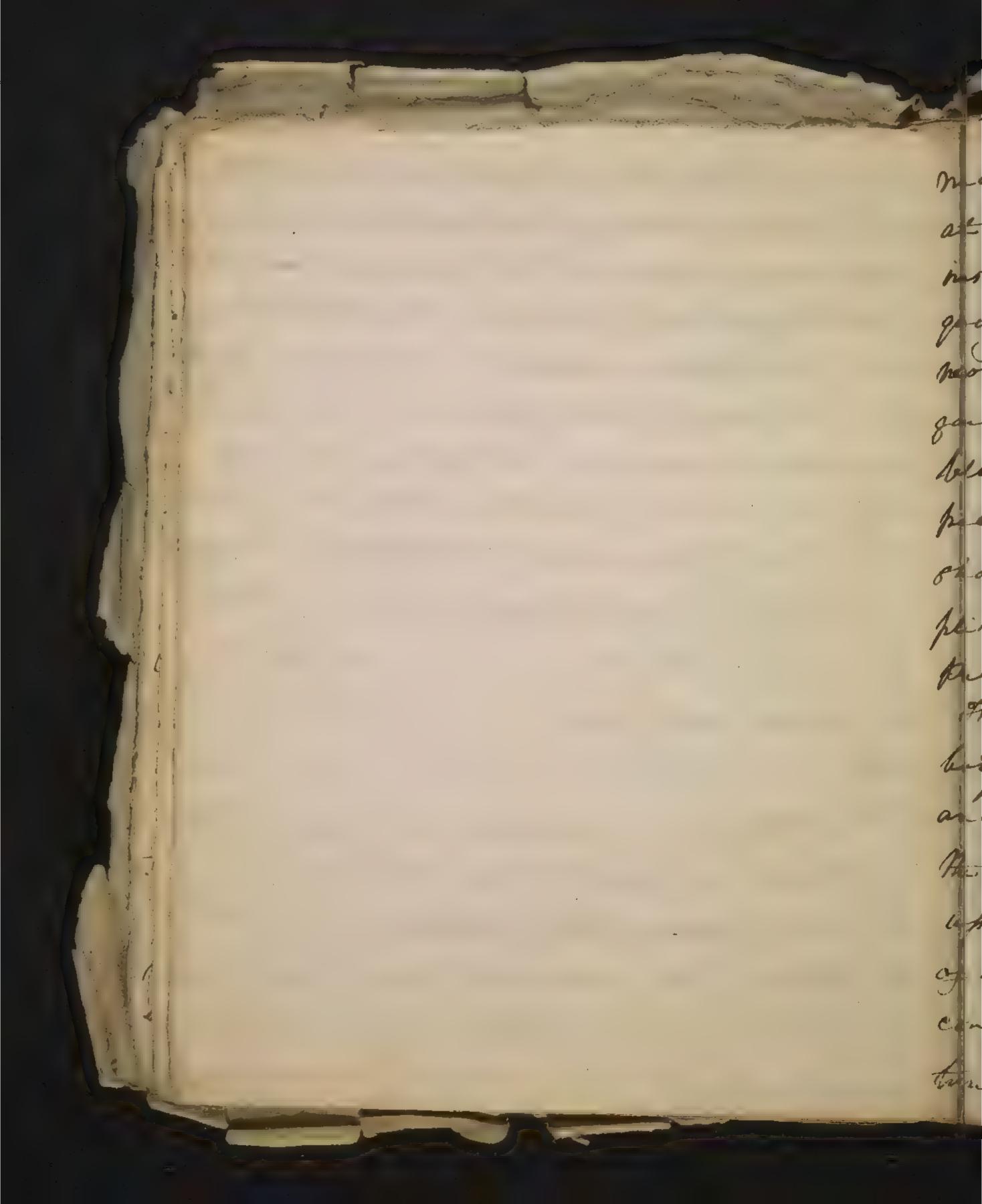
proson son son son son shows pora september de ser de ser de la constante d sainty of despondit and maginion of the arridery Colours of the Colours of t was as price of a for about the their willy at tion which see first oten y the the to be fred to wester the obster and to sing paids, but the front object of met another broken front of sobole to the same de grating de some of Arofotition just he from of the big of the stripe and for of stratigues Under these impressions it has always appeared to be to be a desirable object in an the introductory lestures nather to inquine inte Those subjects of aun and that may may : to gothon, than to consume both time and potente in framing conjectures on the one gin of medicine, or repeating quotation. of history long somes established, and every

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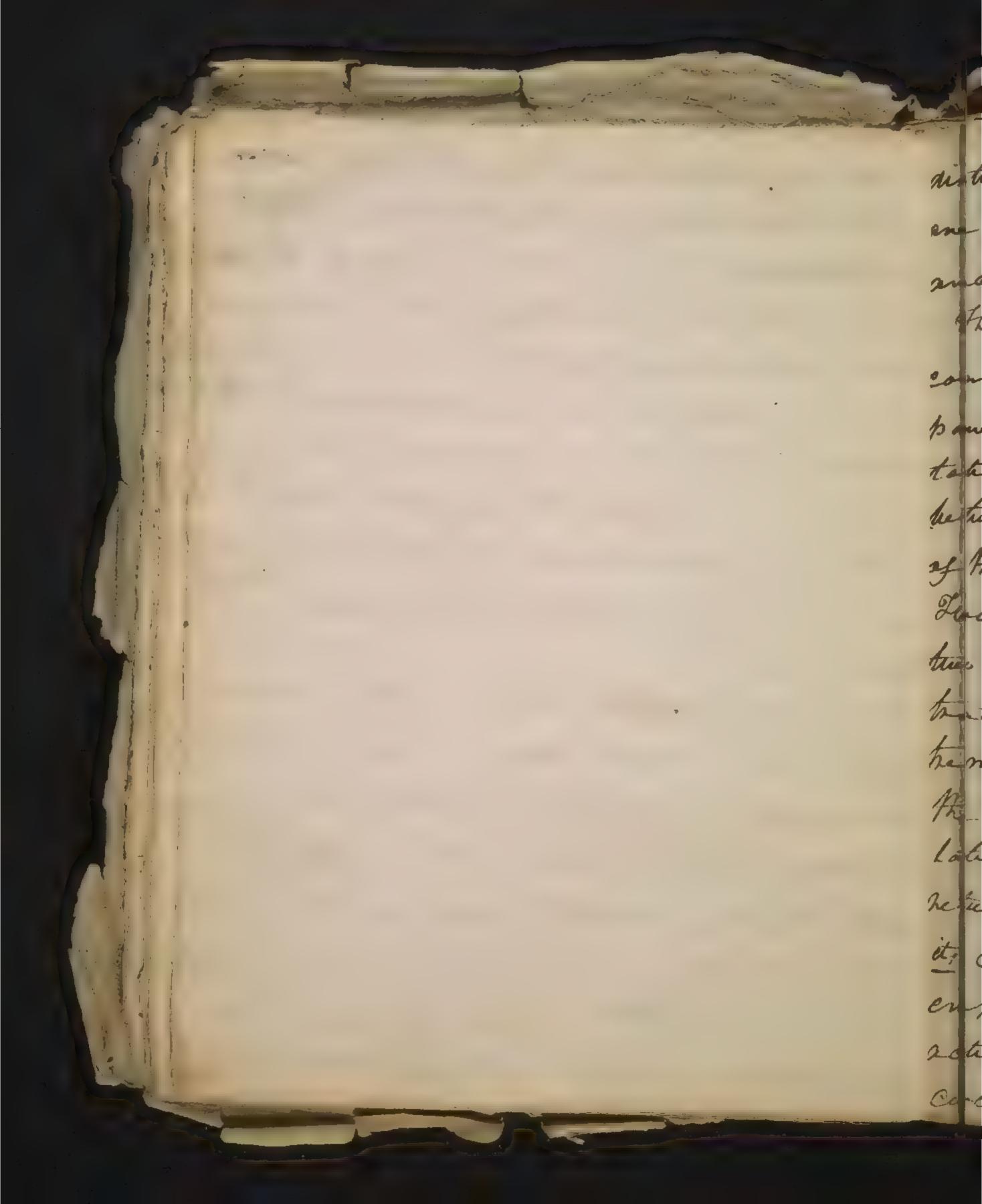
where the be found. But busians the assaulage probably resulting from such a flain of procee dura. There is an other heason with me not less influential. you know that I propose to read to you the lictures of another. and the constantly in the proches of offering remarks on those parts that seems As me quine further elevitation, and of quand ing my pupily against me for what ap= peans doublful in its nature or authority. State my office preducer me from the opportunity and the pedam of offering any extended biever of my awns. - I am happy therfore to en brace the accasion how accurring before you, to communicate the right of my in: animies on the subject I have setested for the present between. It was my intention to give you at this time the right of some observations and se Shations I have made on the Sulsa, and

and the same and the same and The same of the same of the same esp the season of the season was a season of the same of months and the same of the sam from the man of the first of the server Pour the comment of the first of the first of the the same of the sa des s. The knowleage of Ma my office for the one me the officien the way have a factor of the factor of the said many ments - of the sent of the sent

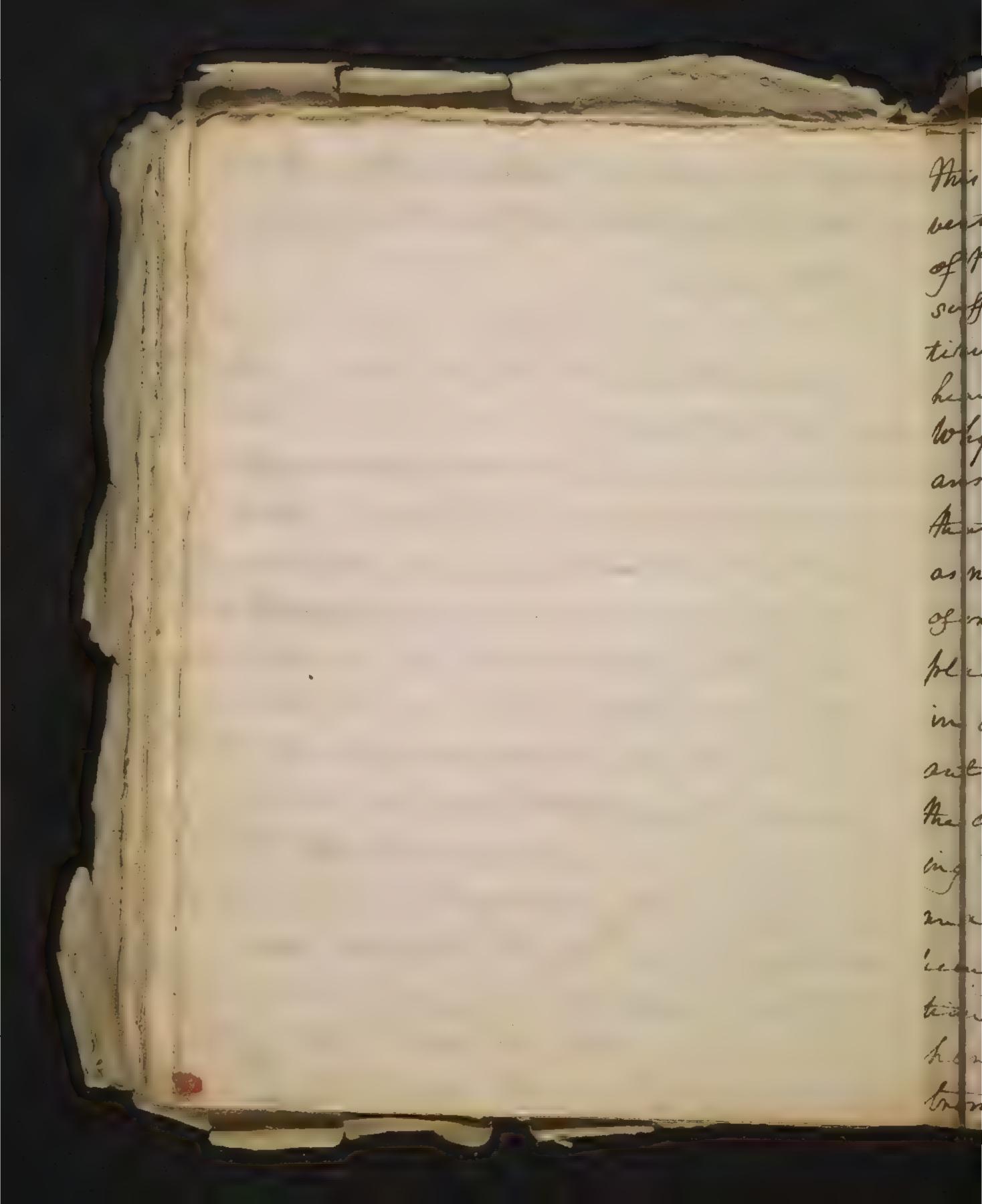
to apply the tenantidge themstacquired to the explination of some of the phenomena, and te the cure of disease. But you are amore that the sederians forms and mades of the Pulse, properly so called , one functions of the diseased Sanguifaraus system - and since the disease functions of this system are only attenations of its healthy action, it is plain that the healthy action of the system, on as it is commany called the circulations of the thos sharla form the basis of an enquiney into The nature and courses of the diseased Pulsa. - I will therefore refer the consederation of the Pulse as a symptom of diseases, with the intention of laying before those of you. who may attend the practice of the Phila Utrus house, the ideas and facts I may pos Sefs on this subject, either in the form of a between, or in the more useful and improprie



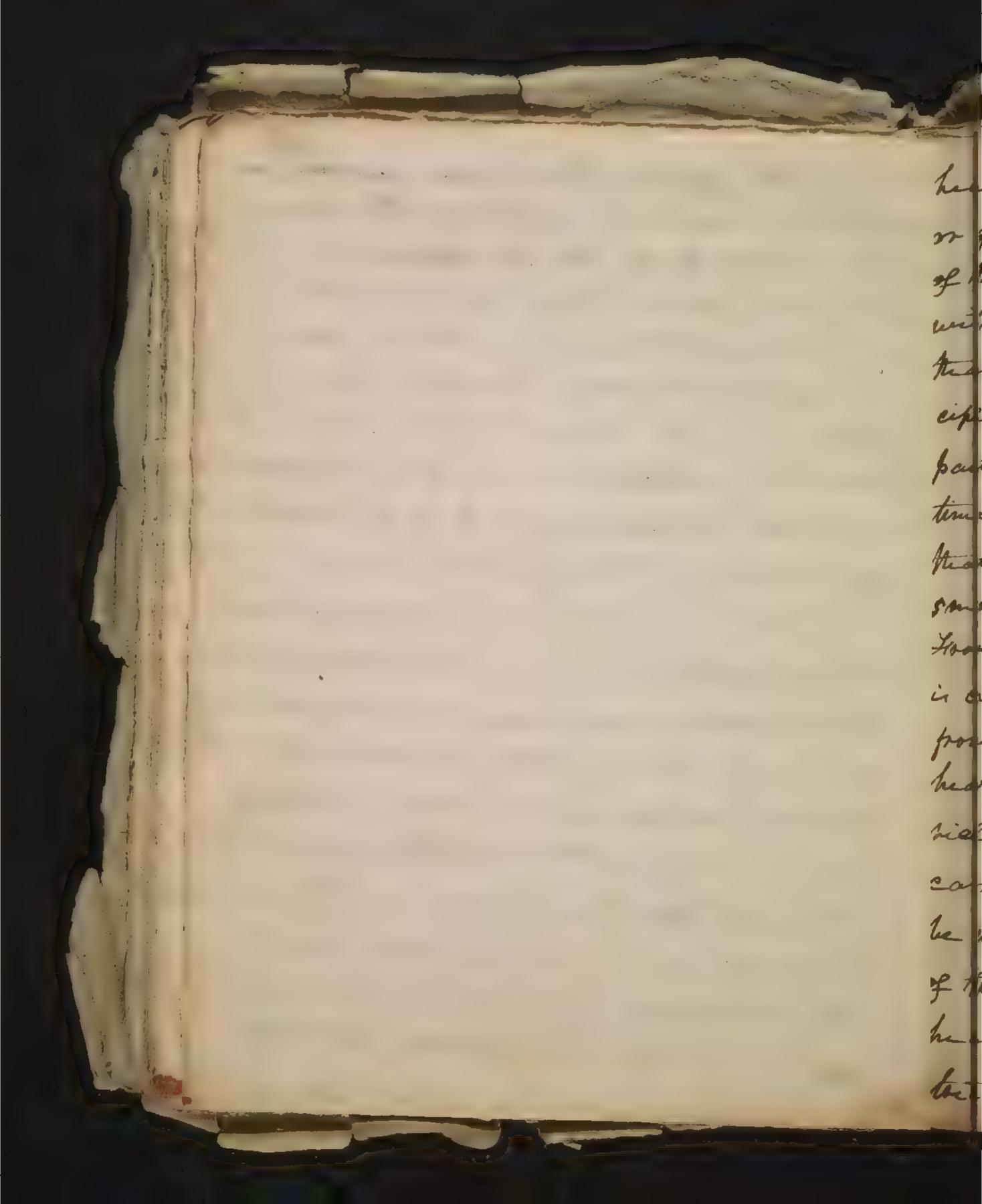
mede of instruction and demonstration at the hedside of the patient, of that institution. I o'ner institute the in quirey into the physiology of the bloodsepely neone particularly of that part wheat se gonar the motion or circulations of the blood, as it is from some original and premiion views by this subject, that of shall hereafter deduce the causes and en plination of some of the phenomena of the The mation of the blood in the human body is carried an throa server of parts And supply which have together her outed the sanguistrans system. There party and lupel, the they pople in common the function of trang metting the blood in a kind of concle of motion, have at the same time structures and actions obviously



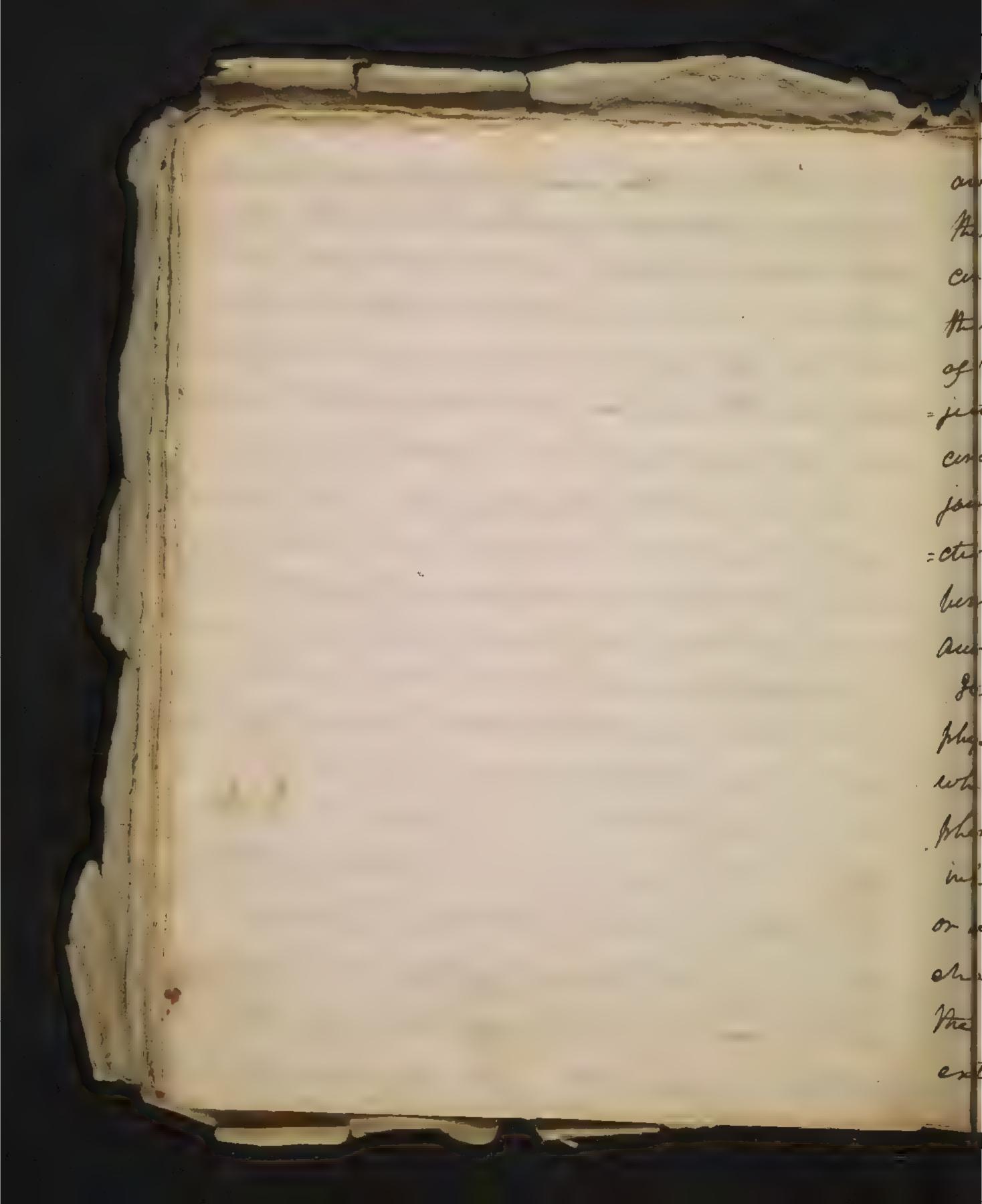
are the Heart, the arteries, the capillaris and the wins. The heart is a museular organ of four communicating compattments, having the power of alternate contraction and dili tation, and funished with babes so placed between its chambers as to all aw a progress of the blood only in one forward directions. dus of there chambers are called auriely and two bentriety. The wentrede by its strong con tractite force propels the blood into the en hemiter of the tuber that arise from it, whilst The auricles being at the same moment de Lated and filled as a recovering by the blood heturning from those extremelies, is prepared by et; contraction to fill the ventricle now emplied and ditating. Thus by an attimate action of the suricle and bentricle is the Circulation continually carried on From



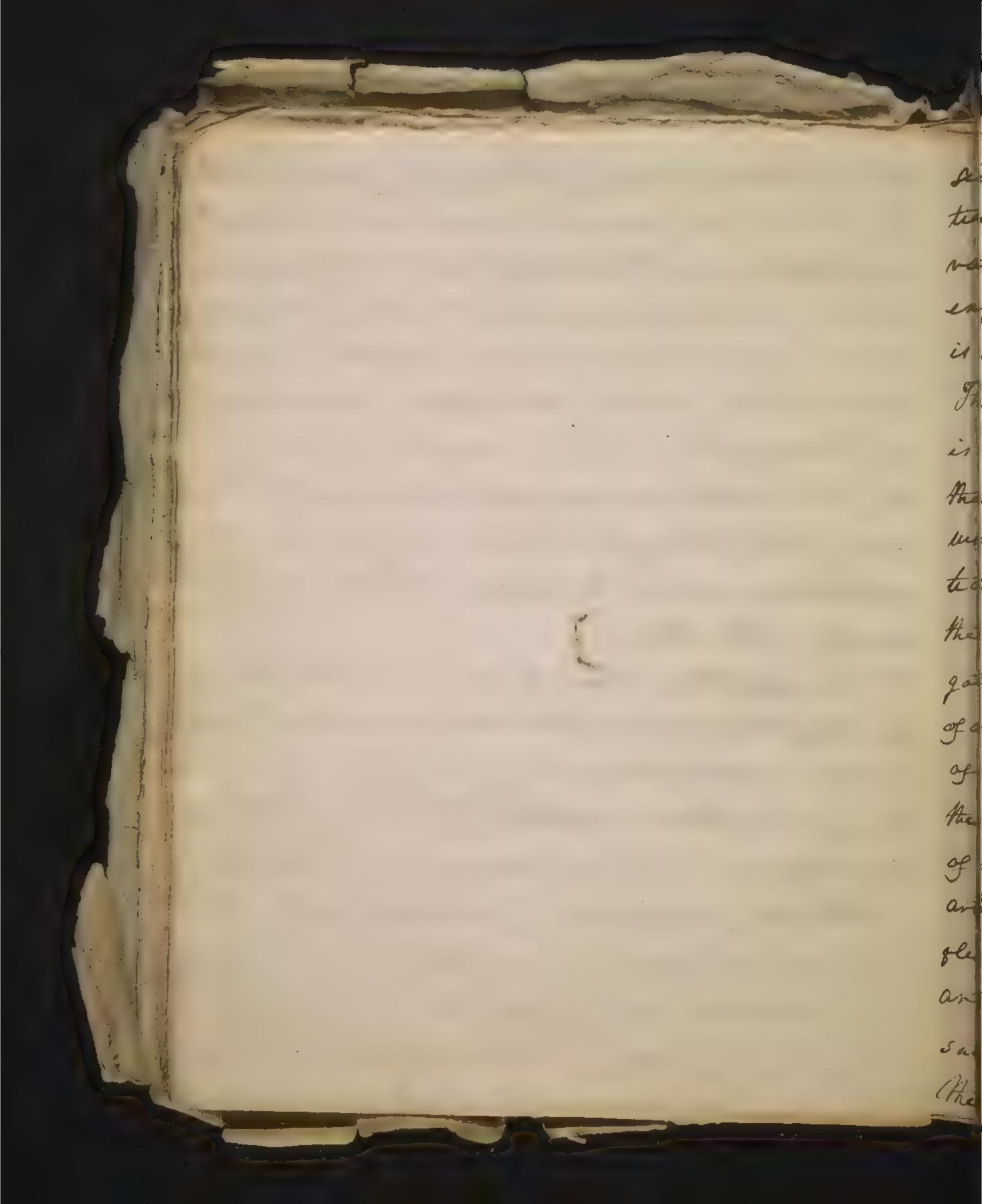
this wiew it oppears that one curicle and benticele placed in a point of the circuit of the bloods path two the bady, would be sufficient apparatus for effecting the contimual circulation, - and that a perfect heart required no more Than there two divisions Why there has the human heart four! do answer this question, it is necessary to remark that before the blood is fit to be de conveyed as noureshment to the body by this single heat of one auxiele and wentricle - it must in some places pout with some of its components, and in others receive some new princeple from with aut. Thus the bland coming in contact with The external surface of the body and implowed ing the perspiration and wrines - Bet the separation in there cares being made som a comparatively small por tion of the extreme upols, perhaps not their. hundre the part, the circulation throthere ex treme upoly is easily carried on by this single



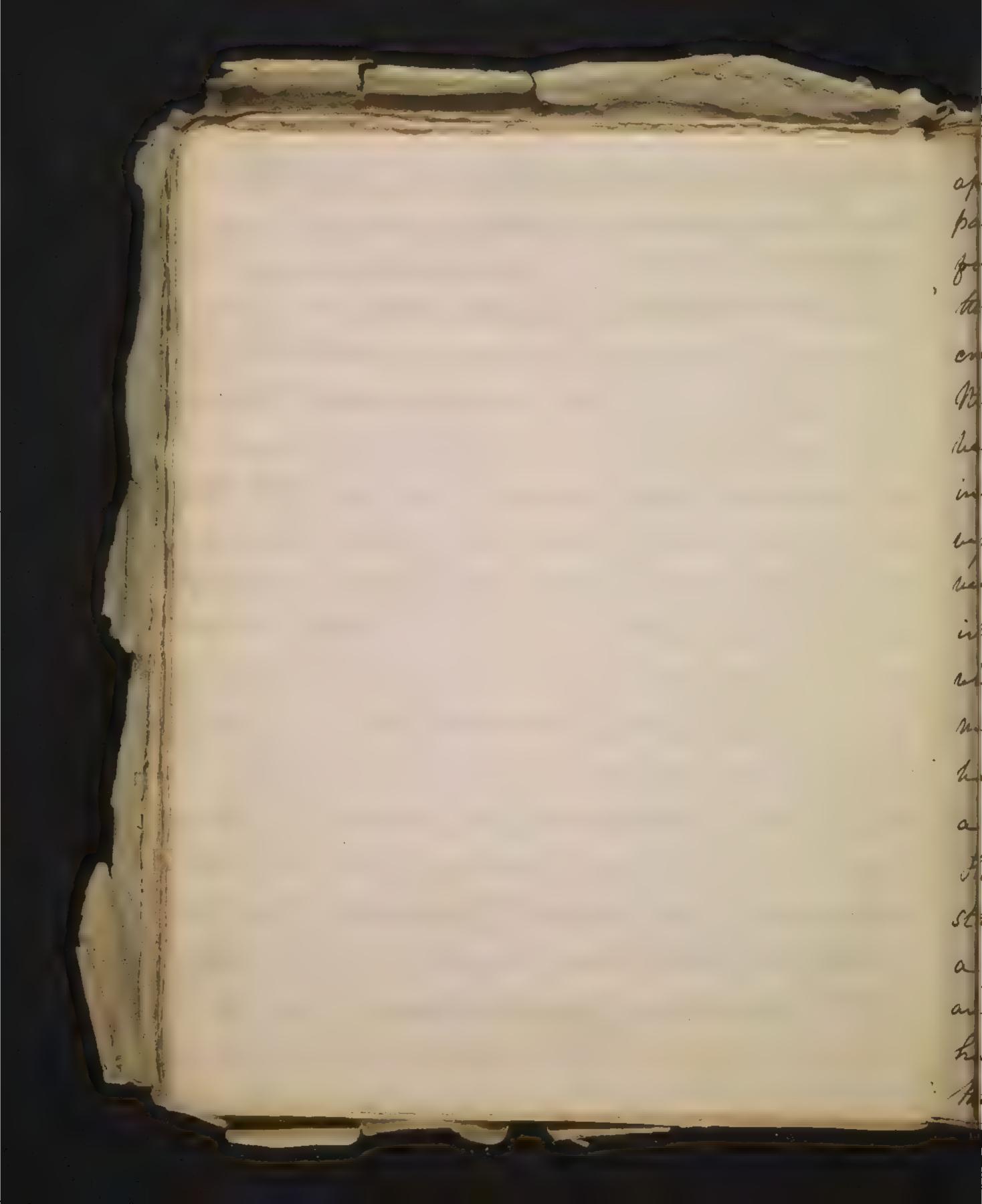
heart, without the aire of any new function or force. - But it is different in the case of the bland receiving a new principle from without, It is a condition of the corculation that the blood shall becieve some new prince ciple from the air, and not only that a small part, but that the whole map shall in a given time he subjected to de influences. This majoines that the blood be sent this an infinite number of small infels spread on the air cells of the lungs. From this extensive surface of printions a resentance is created, not much life than that which arrisg from the blood sent through the body by the single heart - hence then the necepity of a second an siele and wentriele or of an other least to carry on this second cinculations. - It may be leteresting to paint out the wines economy of their being thus joined together - In a single he art as we have been considering it, the ven treete was supported to neturn the blood to its



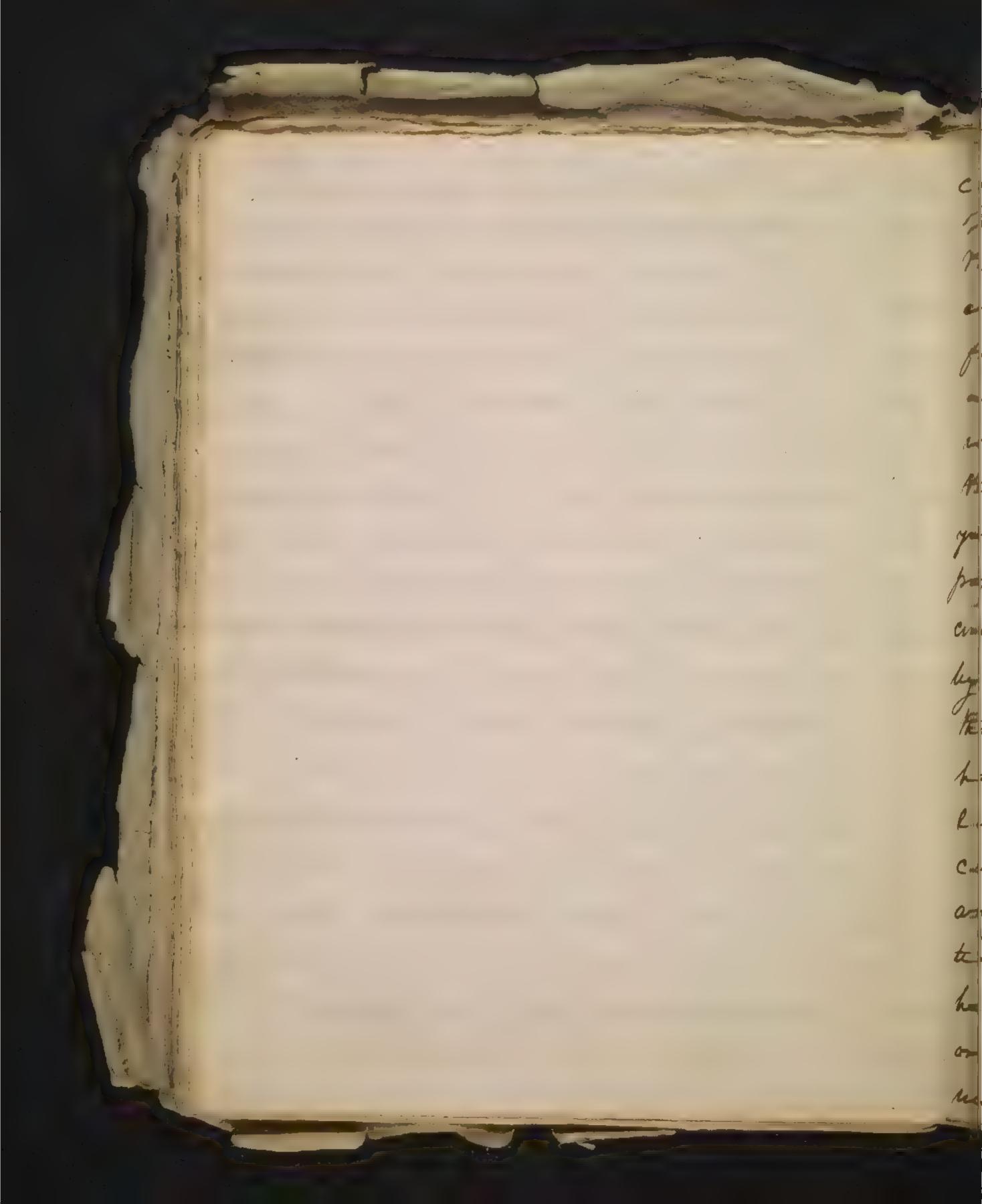
own auxiele, hence if this were done by with The hearts, there could be no community in the circulations of the body. But it is newfrang that the blood sent out for the mourishment of the body should be the same that has been sal justed to the influence of the air by the other circulation. They are then wishy and beautifully joined, by countinch anging as it were, The fun : ctions of the two organs, that is by making the besticte of one heart return its blood to the auricle of the other. -It has sometimes been make a question among physiologists concerning the motion of the hearts. Whether its actitation to am a stine or purpoused the ventgiles whenomenon, that is wither it has in elief an inherent power of expanding, after contraction or wetter this enpansions is produced by the me: chanical effect of the blood pres d'inte it by The contraction of the auricle. Lo me it sums extraordinary that in there latter ages of Thy



scalagy a doubt should exist, since the con timeance of motion in the heart when supa vateo from the body and uply ex some animals expenimentally aumonstrates that the bentrete is delated by a power meriaing in etself. The second part of the circulating of meeture is the actives. They are tubes arrising from The ventricly of the heart. That run into de unions and suledivisions, tete they are distribu ted in their first or Capillary branches, Mosout the whole body. - Hear be shown that the aggre gate areas of the subdiscisions of any one branch of an acting is much greater that the single onen of the scatters of that branch, and consequently that the sum of the areas of a trensueme section of all the capillanies on cotreme branches of the arteries, munt be greater than that of the son gla traducial tube as it beaut the heart. The orteris Menfore in their form have been have been said to rescribble a tree whome, springing from the Least, and in their contents, a come whom



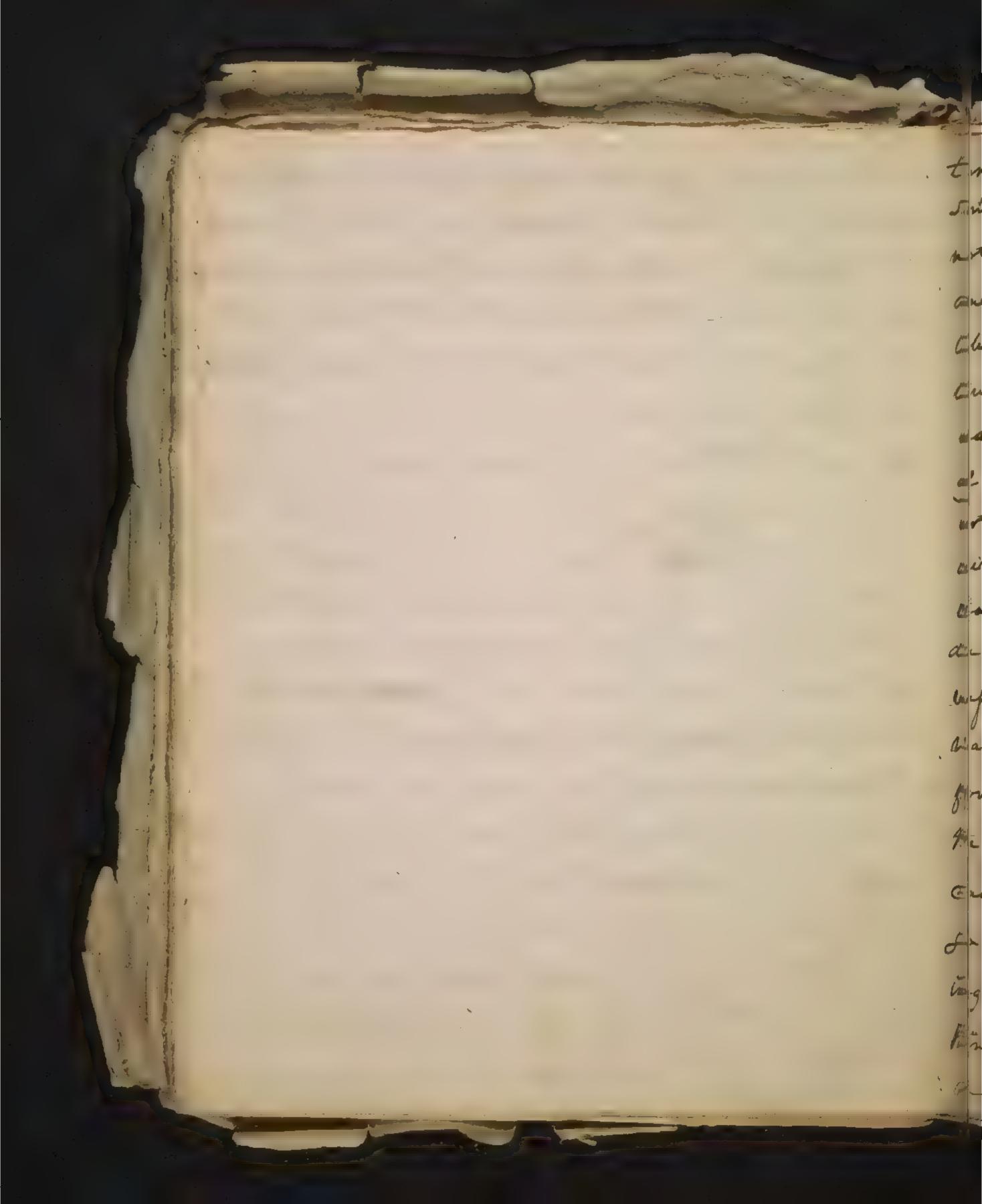
aprex or paint is at the heart, and whose cu: pacity in enemand as its oiverging sides recides from it . - This mereasing capacity of the arterial tuber as they reace on from the heart, necessarily creates a definence in the velocity of the blood that paper theo them. - For this welveity will The inversely as the area of the vefsels, that is in whatever ratio the area of the branching befols enere are, in the same proportion will the relocity of the blood flowing that them be dimin whid . - In the extreme or capellany unfield theafore where the sum of these areas is the greateste, it may be shown that the velocity which the blood had at its ifme from the heart is netarded to a creeping and scarcely measurable mation The coats of the arteris consint of clastic sub: Stance, and of a layer of cercular fibres, of a yelean or straw color in the larger tranks and gradually changing their totales and hue as the uppels dimenish, tite they assume The appearance in the smaller branches, of



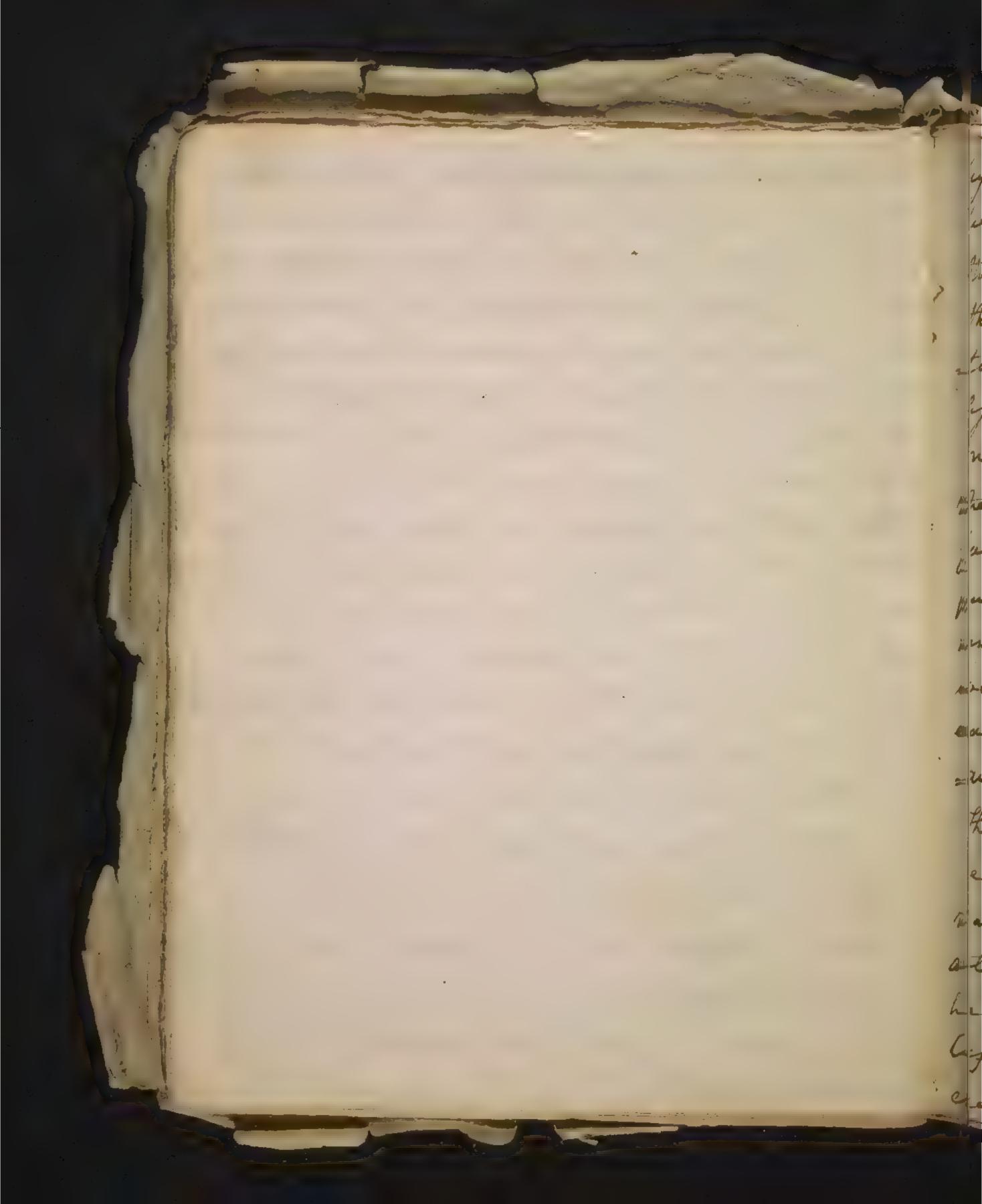
common muscular files - The presence of There fibres in the coat of the arteris hus heen The cause of much phisiologicals discussion and error. - as it was infered that the uspils derived from them the pancer of alternate delitation and contraction similar to the heart, and which served to aid that ongan in propolling the blood the system - I hope to prove to your satisfaction beneafter that the arteries do not populo such pawer: that if they aid populate, the circulation would not be aided, but abstructed by its operation - I shall only remark here that there muscular fibres give a power to the uppels we has been called Torrieity. This torrieity or museu lar produces in the suply the following effects. It causes a variation in the size or trolume of the artery, by its increase or decrease, but this varia tran is not of momentary atternation like the he arty but continues in its state of enlargement or contraction for hours ways and even muchy austion. This variation is as hibited

Vi or by their realus. -

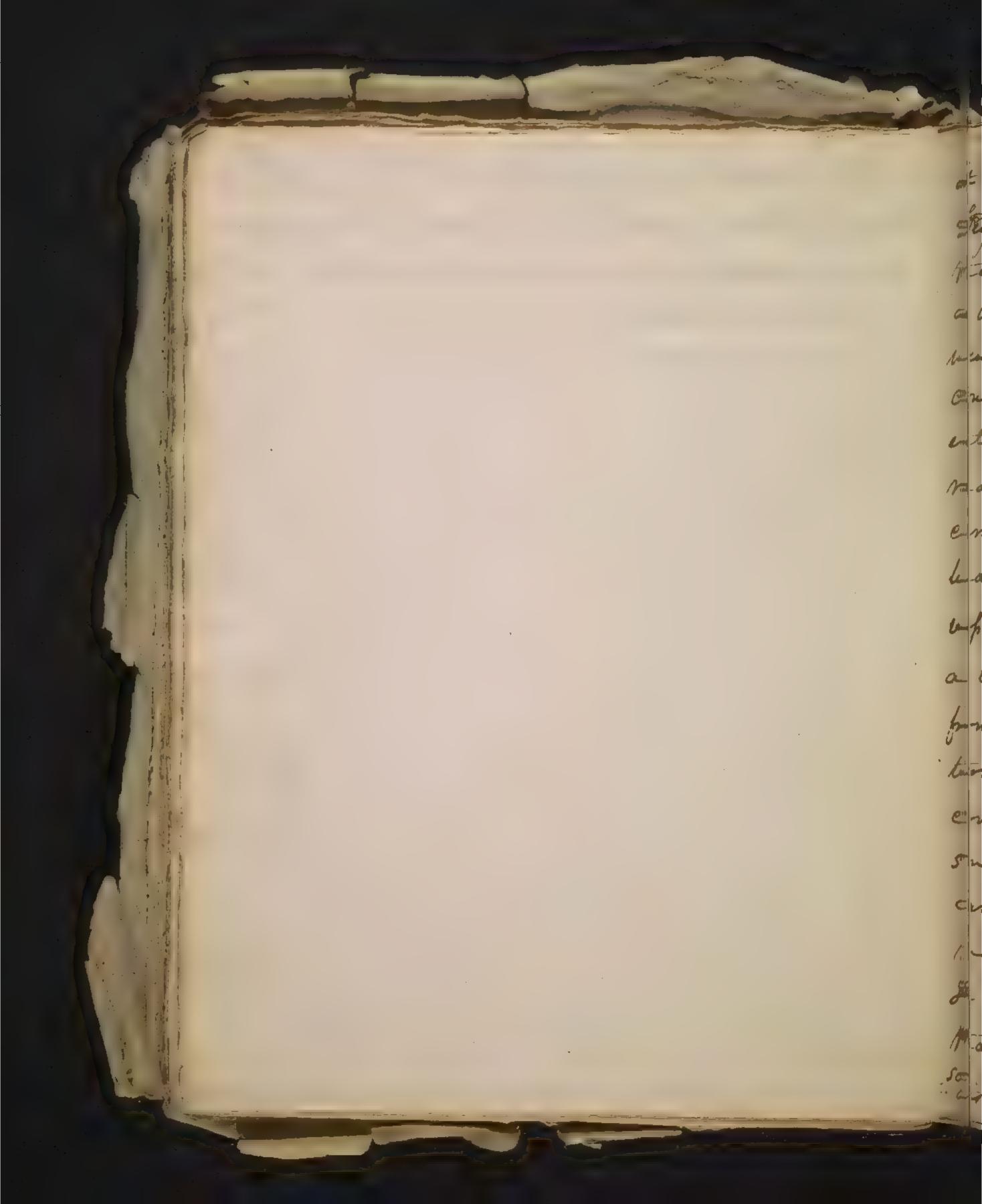
in the changes of the volume of the arting, on exposure the heat or cald, from the influence of the popions, in the cold and hut stuge of fever and in many other diseases, as I shall parte ! cularly show when I treat of the diseased pulse. Other effects of this tonicity are to cause a perma : ment contraction of a wfoll, when it no long en contains blood, when it is laid base, or in possed to the can, when it is out across on di mided, and Sinally at the period of death. At this time the contraction is so close that most of the blood is propol out of the supple arteries oute the veins - some hours often math this tone a contractions ceases, when the elastic substances of the usual sistores the tube to de usual di ameters, and the wood that had been prepo out being prevented by its carquelation in the very from netterning, it leaves them in that empty state in which they are usually found often anath. - although I thus dong a momen



tany contraction and dilatation of the arteris Similar to the pulsation of the heart, I would not be understood to afect that the sander upply are maticules in carrying on the cerculation, abservations and experiments on the arteries of living animal have exhibited the following havidies in their motions - Iron the connection of the heart and large wifels with the trungs, the arteries not very remote from them, have a longeter ainal motion sugnersonous with that of nespera tions. This is sometimes so conse acrable as to pro: duce an anch or cure ature in the length of the repul. There is an other motion alyevoed, sune mo many unth the pulsation of the heart and which from that circumstance has been mistaken for the dilitation and contraction of the arting, This is coursed by the orbestory motion communication for some distance along the uply from the jest ing actions of the heart. There is also a thind mation of the arteris produced by The momentum of the blood driver with them



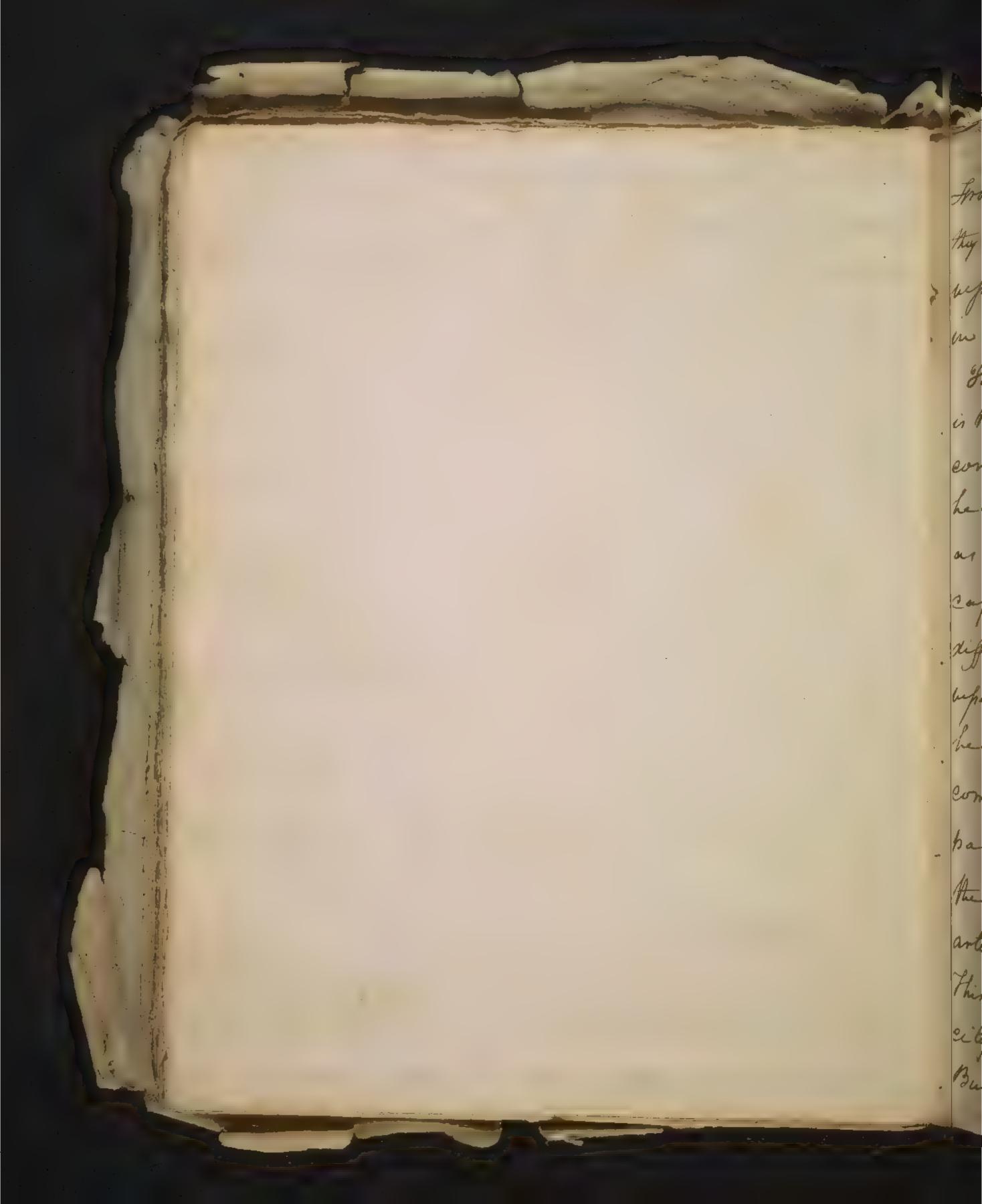
by the stroke of the heart. For this momentum being exerted against the sides of the upsels at Their curreatures and branchings, produces in those repols, according to their loose or from at -tackment to the sumounding party, more or les of a lateral, or verticals or notationy motions - and which from its agreeing with The time of the hearts palsation has been con founded with a supposed whereit power of pulsalion in the articles - The phenomena here ereumenated, and which arise from more locomotion of the upple, have all her point ea aut and ascertained by the accumulately cong = = auctid experiments of Noctor Parry of The resit partion of the circulating System to be considered is the Capillanies. I would not have separated there minute upply from the larger arteris of which they are the mere continuation had not some of their phenomena induced a be lich among some later phiscologuety that they esented an active aguery in the conculation,



It was abaned by Lewen Rook, Baglivi, took Helde, Senae, Kaller and other capesimenting that the blood in the capillaries aid not pursue a uniformly direct course, but that its currenty were promisenancy forward and retragnade in contiguous sufels, and in the same suffer at defin ent times - it was desired too that initation made on these whole coursed warians and opposite currents in them - and there phenomena were assis lua to peculiar properties and functions of these smale supels, quite aixent from there proposed by artires of a langer size. But these appearances all Glow from the innumerable inasculations or connec tions that exist in the capilaries for from ench a construction, any contraction or ailalation of there small sepels produced by an abstraction of their canals or by instation from without, wereld mone the blood inauforeally in any directions -It was further remarked in there Capilaries that we cortain cuticular diseases they were aistended with blood as the cause a westble his

of It was observed two that the blood some times more a on ward in these small there wefuly, after the heart has crased to beats. Leu

ness on the surface and under the influence of certain papions they were sun to be con: : touted into paloup and enlarged to suffusion. There fuets sumed to point aut an active and peculiar function in these uspely - But from what I said on the publicat of the Tonicity or the per manually contracting and delating power of the larger arteries, you are prepared to understand there appearances. The capilaries then do papels the same tonicity as these, and the facts in ques trans proceed from the same junction of the Large arteries continued to the smaller, and purhaps it is exertise as prequently un one as in the other, But the variations of the dimensions of the larger the measurable, are not so often or readily percined, wheres the capilaries of the stefamenhiliting their evitained blood Atmos their transparent coats, as sensilly and quickly show by their color withen the whome of that blood is uneseased on diminished. I



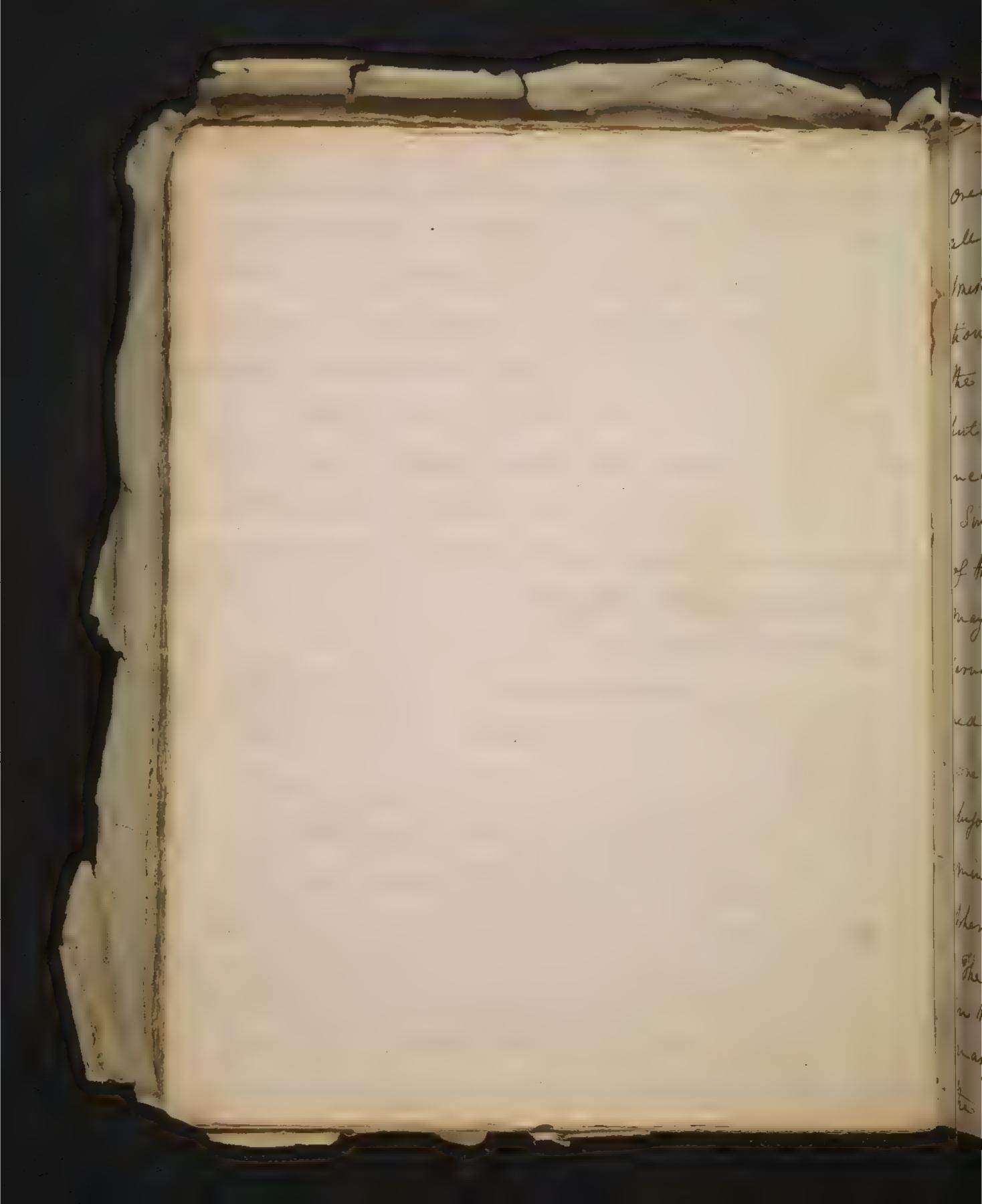
From this view of the facts it appears to me that They are not admit the inference That the outilland supels proper and active and preulian agency in the mork of the circulation. The last partion of the sanguisterous system is the beins. Here like the retering were been compared to a tree whose root is fixed in the he art. and like them too, their capacity encreany on the smaker muthifly and close in with the Capilaries of the arteries. There is however some difference between them. In the small or capilary befull of the being and in the trunk near the he art, the areas are about the same with the comes ponding party of the artiries - But the cu: pacity of the wint within those limits, exceeds The capacity of the same relative extent of the arteries in the proportion of more than two to one. This proportion express the relation of the cupa city of the whole of the veing to that of the arteries But there are some particular parts of these



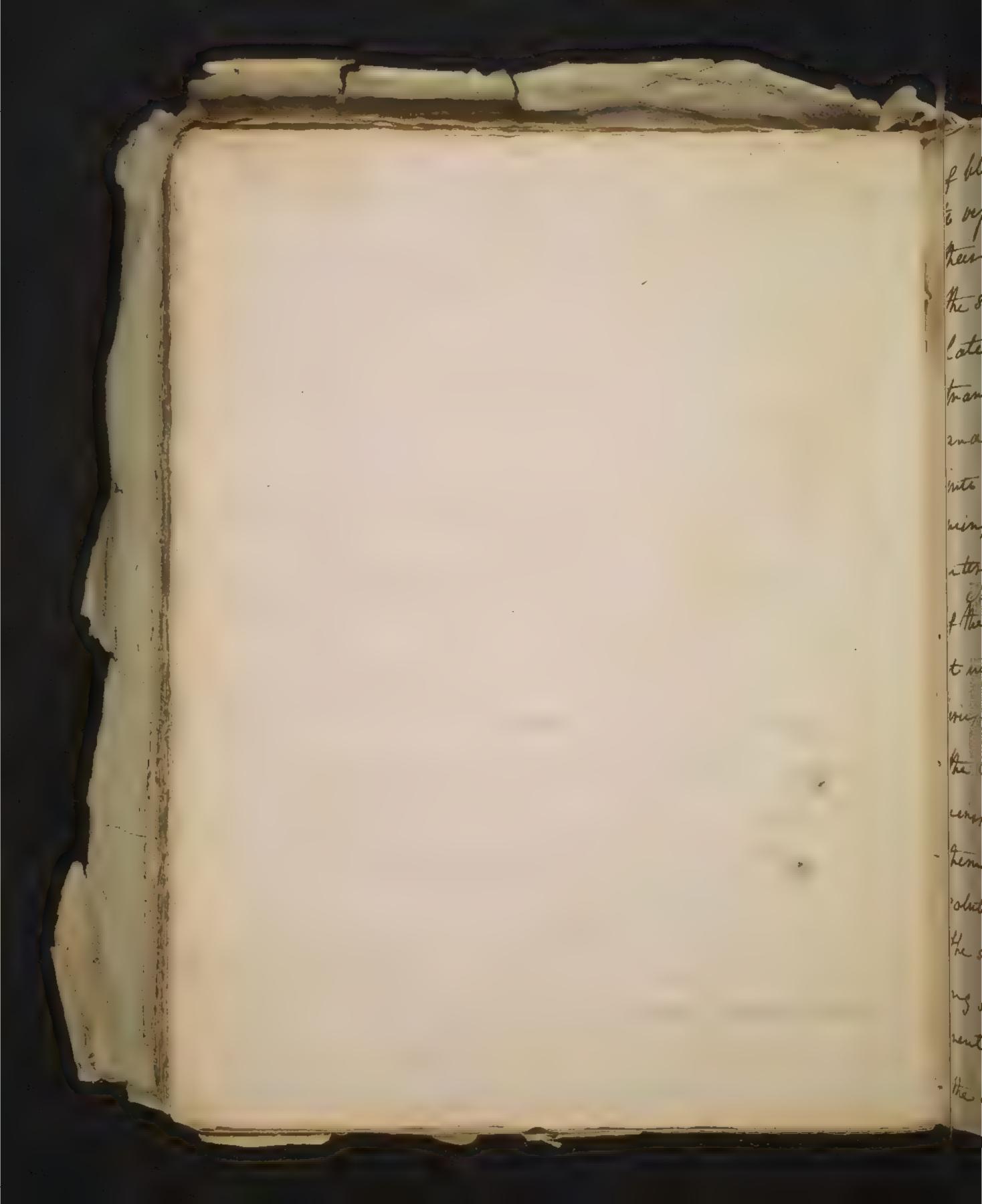
two systems in which the natio of the capacity of being to artery is much greater. I have at the bena of the arm, there are flue veing returning The blood for conveyed by a single arting whose diameter does not esceed that of any one of Those wing - The veins are provided with walky which allow the prograft of the blood in but one direction from the extremities - They have more class licity than arteries, hence they allow greaters destin tion and readily return to their usual size when Mat aistution is remarred. They also propers a Honicity similar to that assibed to the arteries The weins it plans a variation on the size of the tuby, with prequently, and certainly w. Up force. - That this tomicity wrists in the somall or capilary veins, must be infered from their exam ing to blud equalry with the artists, a short time after they are dissided - and its existance. In the larger veins is palpable, in the variation of the size of there wepsels, so Songuently occurring in

from Their contraction V. The actail and manner of its motions were still unknown for Kanny only pointed out its path. te 1 The greatest human sacrifices set before the world have been made for the service of man Seriet _

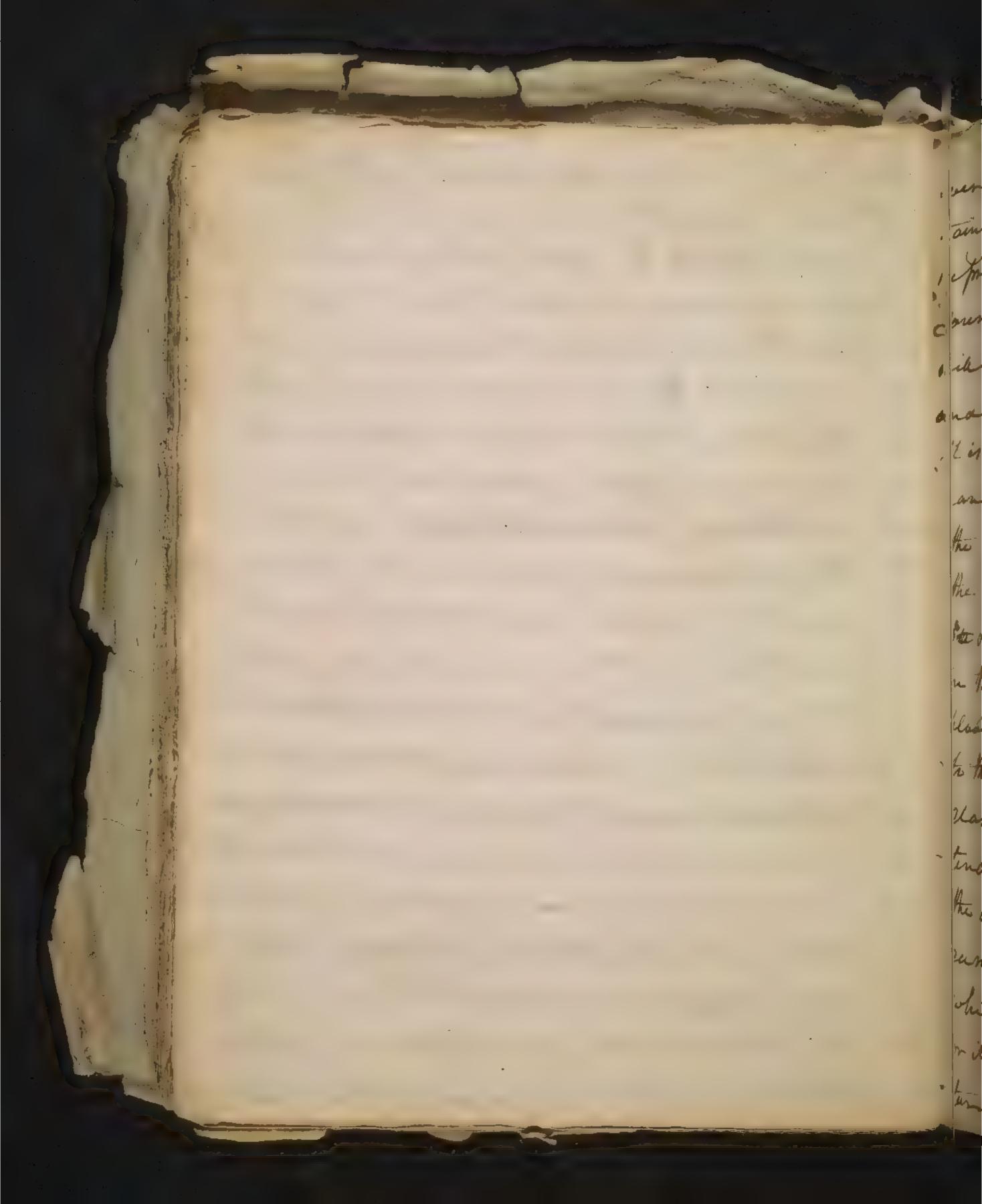
disease, and indus wident on the application of cold to the surface of the healthy had ne Such are the michanical tructure and could tions of the channels throwhich the blood cin outseter in the human body of namain, for me to show the manner on which the actions of that structure produces the circulation. - It is now about two hundred years since De Mullian Hang demonstrated, in opposition to former opinion, The motion of the blood to be in cercular returning oument the body. It was for one man perhops a sufficient contribution to the light of science te un cover this blazins truth a truth whileh while at draw ale eyes by it; beaufits, prostrated ale gratelude by their mensity, and Harvey in thus sitting his light: on the atter of usefulness mas the first offering consumed by it - The man who makes a discovery advantagans to numa mity is often two much employed in contesting with the enemies his greatings has



oreated to have the full prospect and to make all the applications of his truth and Harry presa into the impotence of poverty, by prose ece tion mas obliques to leave to his succepross the completions of a work he had undertaken but which he had not the means or times or en e an magement te fulfile I were the time of Harvey defferent explinations of the circulation have been proposed, and it may seem strange that a subject so open to ob: Servation and confoisiment, should yet be absen hed by difference and doubt. I shall mention one or two of them, with the objection, against them before propasing that which has arrisen in my minds for an induction from the structure and phenomena of the Baraquefirous system in The first spinion on the circulation that arose in the school of Havey, and which is held by many at this time, was that the contaction of The left ventreete, descharged about two aunces



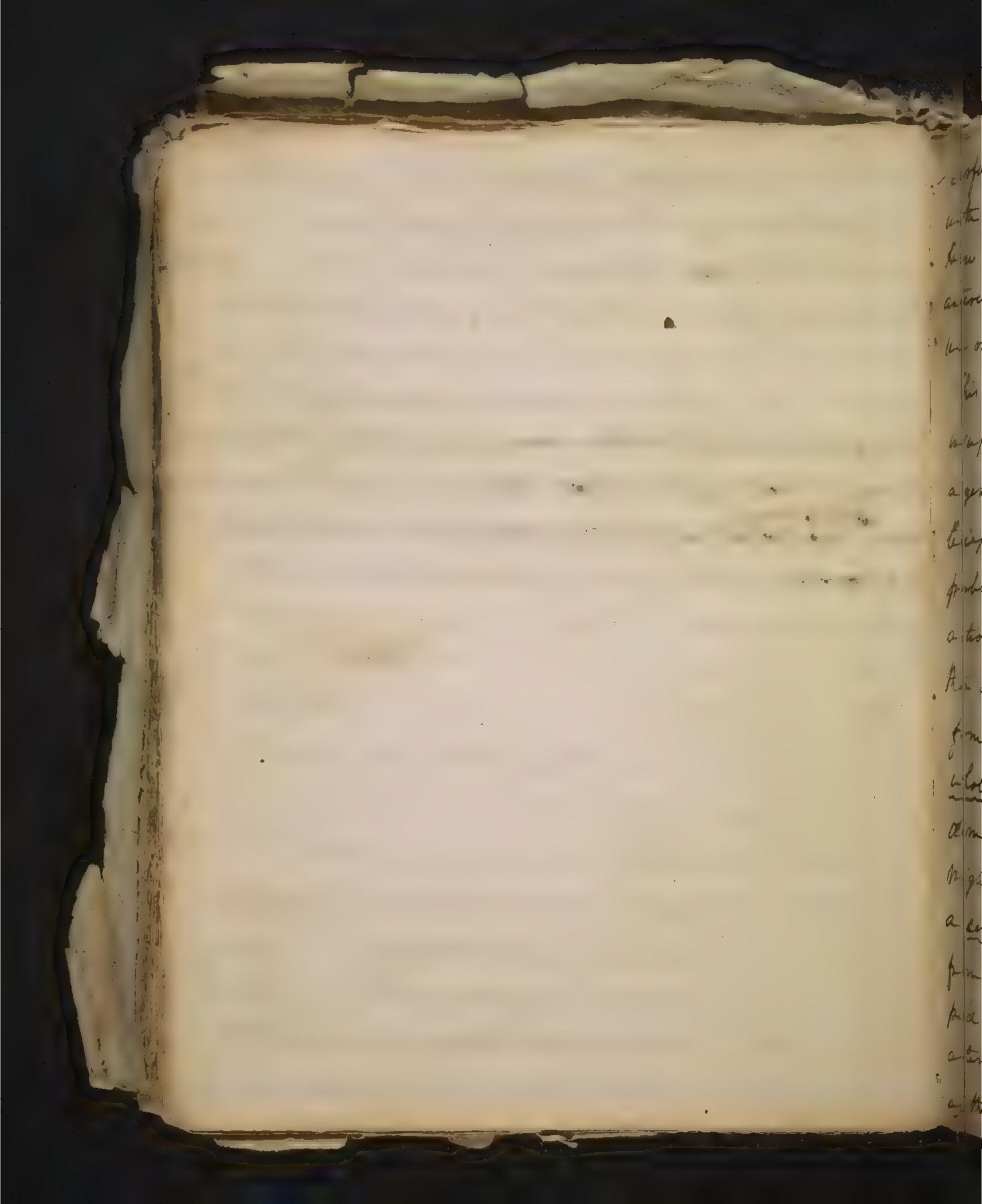
of blood inte the arting. The assition of this quantity to refuly already fills, caused a aitatation of Their sides this out the whole artired system, In the succeeding moment when the heart be gan to an late the arteries being no longer preparty the en trance of blood, again in their twon to contract and the values at the heart preventing its returns with that ony an it was driven forward with the ming, and thus by the atternate stroke of heart and artery, the motion was affected in this first rection of the orealating system. - according to this opinion it was continued in the wing, by the force of the ar living be hind, by an absorbing or suttions power in the capillang veins, by a slight contraction of the very themselves, and by the prepure of musely upon them . - there was maced some planshitity in thes solutions considered as an early trials of enquire The sursation of a shack on prefing an artery, he my such as might arise from its sunden enlarge ment, the visible motion of superficial refuls, and The supposed necepity of an aid to the heart, to



overcome the mustances of the blood, were con: tainly facts that might have less without much reproach of reasoning to the false induction Sounded upon them. - This explination however mile be found madmissible, on a close observation and companies on of the phenomena of the circulation It is a formed in this wien that the heart alone cannot over come the sentance of the while the the blood, and lines the nearfuly of the puly above of the arteries - Withaut rejecting this as more hypothers Stee may be asked if there is any gain to the heart he Thus adding to the resistance of the weight of the blood and its pistion on the upply, in odding I say to there, the further resistance of distinding the strong clastice coat of the upply this and their weder ex tended surface - But asmitting even this, and that the arting after being distinded contract upon it, accounts cumulation continte it is plain the force with which it contracts must be left than the heart or it muit be be the same crit muit be grea turn. - If it is life there is a pasitive laps, by the

of the arting exceed that of the heart.

heart expending a greater force in distinding This arting, thou it receives in return and our has trons - 4 it be the same, there is no gain, and of The artiries contract with a greater power than the heart, have dur it happen that on the divi sion of an arting, the fet or mamentum of black is agreement the exposition of the sorting, or the torace of the heart, wellow, the down the committee tion of a best dy sorper this force of the hart - But further if the artiries are duter ded by the blowd from the heart, it must be because the blood does not pap out at the other extremity or that it paper ant slower than it is believed, in either of which cases there would be a queater or less puls ation percieved in the viens - and yet the mation of the views is of one uniform current. Again The arteries of the whole body if intended superficially would accurate a space greater than the surface of The stem. how it must be unident that if the two anney of blood, thrown into them and which are supposed to come their pulse, were spread on this



Surface, it would not cover a fourth part of it with a strutum of the least measurable Thrakings Have them could the true across when thrown with the altereis and operand through them produce a sense ble on effectival poderation them. This last objection having been admitted as an Insuperable arquement against the doctrice of a general ailitation and contraction of the an teries, an other attempt was made to salve the problim of the circulations by considering the action of the arting as partial, come phisologests then acknowledging that the two suncer projected from the heart, was not sufficient to distind the whole of the arterial system at once, to any statistice dimention - aperted that this quantity of two auners might produce the piquesice enlargement themount a certain estint of the arting, suppose twelver inches from the heart, this portion they contracting, pro: pla part of its content, into a second portion of the arting of a certain estent, and their by a succession of there pulsations of timited portions of the

To stangs in a begical point of view -

arteries continued to the extremetry of the Enfilaring the blood being obstructed by the values at the heart from returning was carried formeands to The viens -It was in ohost making these successive portions of the artery, so many cylinarical hearts, only having no walney be tween them them to the town of the contant to the total the second the son succession to the state that the state of the sta word attended the one of the continues reactor of the toront of and the toront In reviewing this rationale of the arautations of med searely lette the younget of your that it allogether an hypothesis, for what absention has marked and inaced could mark the motions on which it is grounded - It may purhaps be be garded as merely one of those schemer, so common in seince, for the awelopement of subjects on which knowledge is bothe disorable and defi cisut. - The Home of the one Fred to the fact of the services

So It is apremed in this theory that white the wenticle is contracting the first portion of the aorta is dilating to recieve the injection blood. Whilst The verticle is in the pouse of its detatation this first portion is contracting and the second portion of the acreta is alating to recion the blood prefer on by the first portion, so that.

convaires in the affer to the total of they are the first for it the aibilation of the. successive portion of the activity for the seast to the estrement to all made in the wayle post of time; a which the left own brief it saw for the eyes or buscons to dis tanguish any mioney in the time of them succession motions - the potos works therefore approve to for one agrant aititation of the constitution there was the board of their ofice prome Jobut even as an hypotheris it will be easy to show that the operation of the proposed seteme muned produce effect, very differtul from The seek phe somena of the circulation of a regularies where shows are any informations look the fitter with a force, and an worth on the good the former for the same appearant without on agrice quality with flow from the other options of the longton of the tetter- for some to astroctton quantity our now extended the with ange of one of wat back

the ventricle and the second portion are \$ 3/E hothe indelation at the same time, whelst a a The first portion and the third are contracting OF TOP at the same time - and of this alternate action y was is continued to the end of the arteries, the proproxim gression of the ood numbers of these sections the year unile be in a state of Delatation, at the time for The progression of the even numbers are in a State of contraction, any true of contiguous por of the trong well therefore in their actions, resemble the april allemate action of the auxiele and wentered of the of the Least. - Since Therefore there is as much of 400 the whole entent of supply in the state of contract total tion as the house, it is impropile there could to the be that universal sunch onany stroke that is fett in the seleving . - But further there is a fact on the subject of this sunch son was Throke that paints out more precisely the utter un possibility of such a succession of action in the artery as the theory supposed . - It has vein shawn by the detail of this Theory

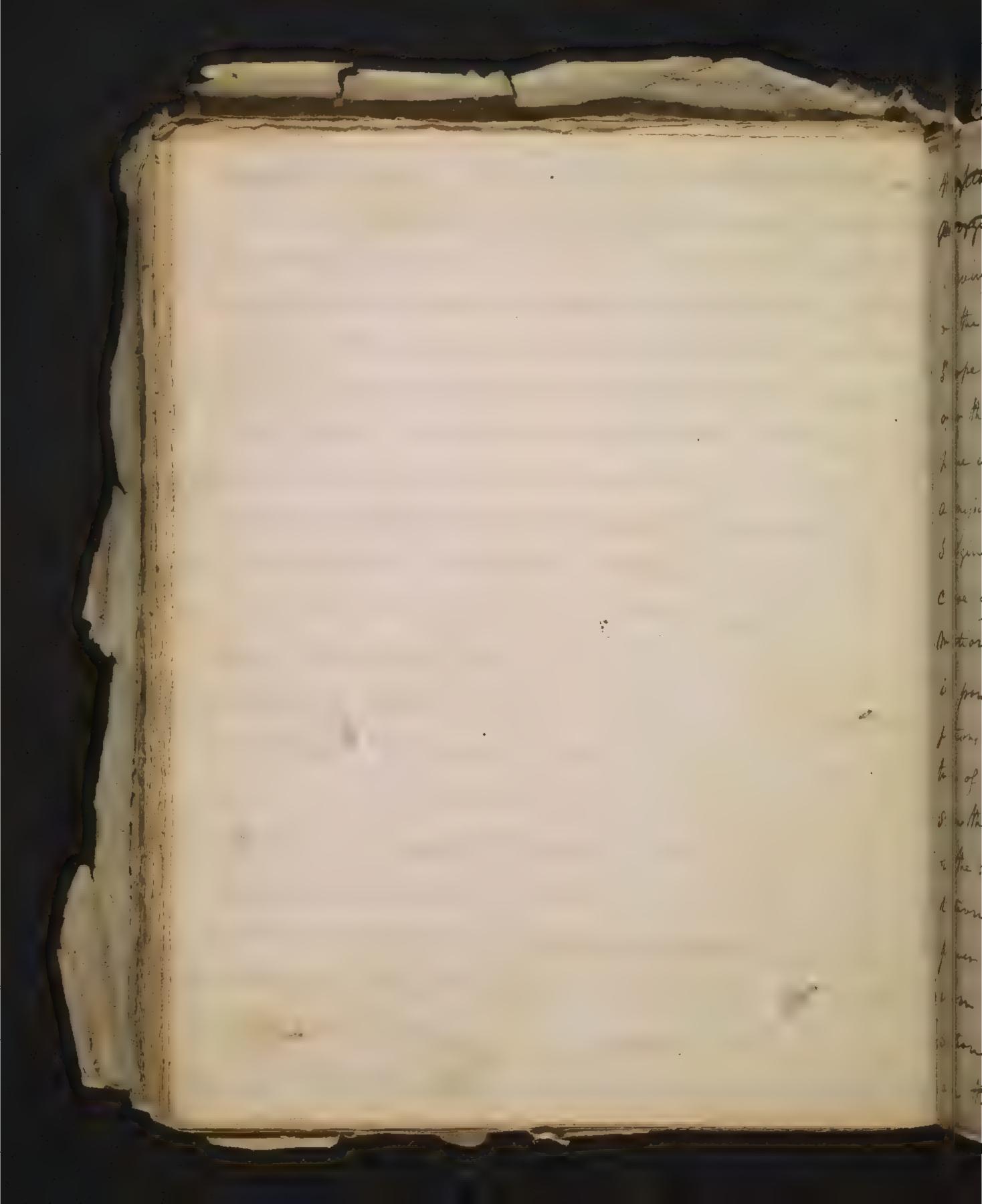
It appears has partyon of the reconstitute of downty in the y segron much show why the petosity of the fint the past of with com mo: parciention, defotosys that the orlanding the the grantity most breegen face of the og me will the brue of all the intermediate quantity of fine for if st were therein, there would be comprised for of this intermediate quantities on a la Cation of the the cofin des , which by the soon with my of the proposite iet on asophiles - The state city and sprace desere hof was wither whole their general was the the between and space of the roomstea flooring andity. The motion of fluid or dets and to good to the to to how of solar, incated the smotion of the sola col is from of fuery, he gand or in them they is in my coihouldon afthe plating porter of partigler, list and appointed mythoung the whole the cong etu in augurent with study thorogen there byber hus for here if the rejection of the the discharge the greater Han the miretanog of the toley y there will be distincted on the within from of any town

That when any one of these limited portions of the arting is in a state of withachon and propelling you it contained blood, the next portion in advance 1 is at the same time attaling to recion it, as They trem exactly resemble both in the mode that of their mation and their effect the auxiele oil wentricle of the heart, we may take the termy of the of arricle and bentricle of convertible write Thore of any two portions of the artery, so that the wind whole of the activial course wile represent and 4 alimate siries of auriely and wentirely - Recollect by however that I make this substitution of termy I'm and this analogy only to afford an easien compre but Lension of the argument. - naw suppose tim au plon ricles and ten ventrieles Thus alternately continuent on by the contraction of the first ventriete cannot me ch the tente, tile it has succeptually undergone The contraction of the eight intermediate hearts Cly, that is the blood can not heach the that bentricle, untile the time occupied by right

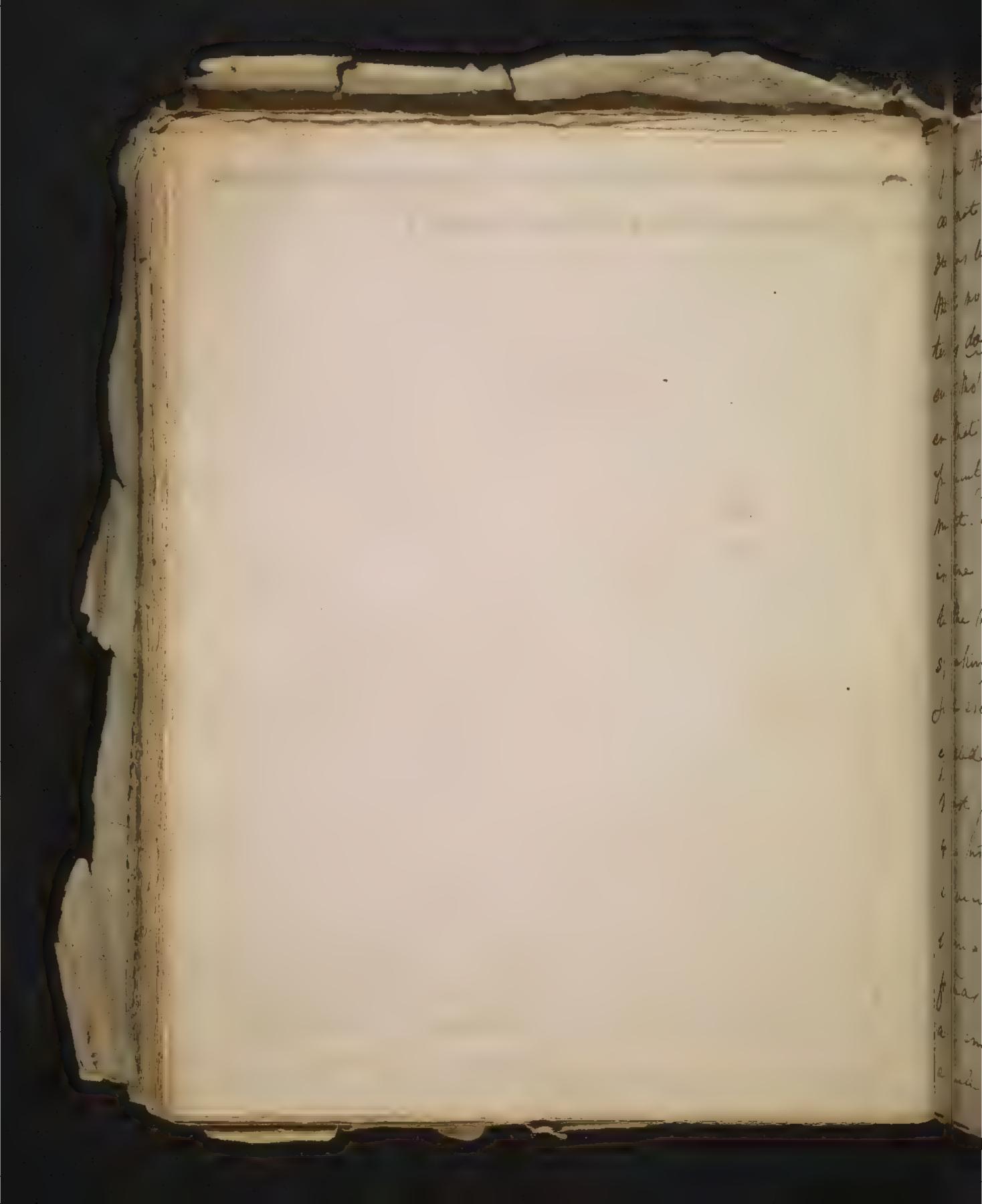
he quality of parise, the space in quencqual is the lay butty of that receive como over the hang will take nce place que the mostion with set be of the solid as column beat of the particly comparing the column as whom betations forsthought with he changed by lateral Le a gra of the ination of the yellaing and the my of the hyber . - how to spply ther the hyprothers the before up to her the langet project its two some of House the spoto the fire portion of the Rosta which the box as get at tweeters inches the sides of the orfit are destin olle yet by a spronger copatie of containing this additional y quantity, and more it detchouse gett from its who have from the he wast, where the contraction of the an portions of the dupic of the out of the out of the dupic of the dup men toward full received it any change from the one se at parte from the heart, lite the decourt forties as see you from of the across, this second section performs the the and their the is concern the a with sucception section of the suchimum distanting in long the to as they seppronate the wing store as it is the quantity of book thrown with one of the section

Successive contractions vill home elapsid. and the same will happen if there showed to be a pause of the first betutricle, and no bling should be cast out. - That pause or that self sicioner of blows well not be fett by the most tenth bentiele tite the time of ale the interme to diate ones has elapsed. - If instead of the texte The sisth be taken itis suident that the truce in which the pause unle he porceived in it out be life - so that it is impossible that the pause will can be fett at the same time in any two after ent benticely. - how in the circulation of the blus the heart occasionally suffers such a pause as we have been supposing, on such accusions I have proved with the side of an of sirtant, as any of you may prone by like objut hatron, that the pause is fett in all distancy the of the artirity, in the Carotides at the anche and at the wrist, at the same instant of time - of the a theory thenfore that contradicts a manifest to thenomenon of the circulation cannot be tree to

2. Heat sale raines its lingth, at follows that in ed the expileresist, where the quantity is the beauty api bling the langth of the section will also the - What opiqueter, hick will gat an onmores months in the whole from the heart the sing the same of the blood from the train of the two anness the text of the strong of the blood from the train of the trains of the blood from the train of the trains of the two anness the the trains of the trains of the two anness the trains of the two anness of the trains por Aje he out jit it plain that the mistion of ch are of the section in the second to the - of hace she bace, there is, the welling of the dis 44 frances bears from the most anyone of my then seations with the world getton deliveraged an from the to set a 20th Best with donner 3- See that the second state of front such a into the bearing of the bearing of the person of the perso the time of the of the of the standing from Mutotangle or treble the arinary makey



the person the Read to come fortending Harongarton or and with I -I sveng their stated the two prevailing opening on the subject of the circulation, and quen as 3 hope satisfactory objections to them 3 shall non offen that which I hape will be shown both to have its foundation in observation, and to former admissible explinations of the phenomenas. I begin by remarking that the heart is the sole cause of the motion of the blood thro the befuly. His motion of the heart hour hours seen and fitte, and its power has been proved by expaniments; no ob: justion, Therefore to its being the sale cause of the mos tion of the blood, can be admitted, but those that show that it is aided by some other power, the indy to the he sit were supposed to be shown in the dila tation and contraction of the uple, he suchon power of the veins, and the prepune of the musely upon them - on the lint of there points, the pul sation of the uspely, I have already shown a pri one that no such pulsation cauld take place



from the operation of its supposed caused, But & do not wish my argument should but on this alone It has been proved by observations and caperiments that we such dilatation and contaction of the ar tening day exist. - It has been admitted by Hatter even tho' he assistes the pulse to the dilitation of the art eng, that the inspection of the automin of living animals pequently or hibited no sign of their atternate more muit. Birchat afternoonly denied alto getter the ox istance of this ditatation and as cribed the pulsa to the motion of the whole arting, or what is called in speaking of the arteries, their locamotions. - 13 wt the full establishment of this opinions has talely han efected by botton Perry of 102th by a series of the most precios enfraiments. - Doctor Parry has quen the Instory of 27. different caprimainty made with a vine the discover the functions of arteries in living animals. In there aproted by his medical primar he esposed, different wefsely, and this they ale employed the most alcentite absorbations as well as with Some moder of mechanical

Vi analagies in mature are not manting, to warm to ever no of the problematical nature of this aprimption. which seems to be grounded soly on the idea of The newfrety of and universality of attraction, - The appearant supulsion or at least the weaut of attraction between mater and the leavy of some Ray The polished coat of the Britis he another of there

measuriment, they were unable to detect the hast dilatation or contraction of the ortery. - There was no acception live from the exposure of the supels, as the pulse was fett on pressing the before as sensebly as before it was laise bane. we see then no profile found ations for the opinion that the arteries oford any aid to the heart in carrying on the circulations. The idea of side hing xisiwa from capilling attraction in the wins, or as it is call a thin suction powers, is equally unsales factory. In the first place as it is said to take place In supely too minute to be the subject of objection or experiment, the existance of this capillong attraction between the internal coats of veins and the blood is entirely an opention. But aleaving its existance it is easy to see it must be an obstruction to the are absurdity be apume a u, a course of its prograp. with negana to any aid from the Musely of the Their prefum on the very during their action, & would only objecte, that this cause if it were

Vi Thus if a cynimarical like whose sides are unyilding be filed with an moonpropible fluid, and an additional quantity he prefer to into one end, at the same appearant in:

effectual could be so only accasionally, and therefore disover no conscaration, in an enquiry after the continual causes of the circulation. as no cause can be shown to afford aid to the heart, it remains for this organ alone to carry or The cerculation, The sufficiency of its power of hope to make manifest in as the action of the heart is excelled on producing motion in a flicial, it will be meafoury for the un a law directioning of what I activer, to explain to you the there of moving fluids. - There of from their conjecting of particles easily moveeble among one unother, and propring lettle mulual cohesions are capable of two Kinas of Motion, the one a motion of their whole Mos the consmon with solid hodies, the other a betration or unautation of the particiles themselves, communica that sneedfinely from one to the other throand the pour a fluid incot the sepper one it wite quetly to ap the and to discharged at the other, here they on as motion and servicte alwaity of the whole thangs.

stant an equal quantity will flow from the other extremity. For since the admitted . to were quantity cannot enter, but by the space offerded by the discharge of an equal bulk of the it is plain the admitted quantity, is the two of 1 course of the motion of that discharged, and as no reason can be shown why the velocity of the first should be either mereased or die menerted auxing its communication, it follows that the velocities of the two quantities must be in the equal, and the same will be true of all the it the intermediate quantities, for if it were other you the were there would be a compression of the to we on or a delatation of the oylendar, which by me by the conditions of the proportion is impospilled no This motion as it is analogous to the motion formy of solide bodies, is called the motion of the solid or continuous column of fluck -

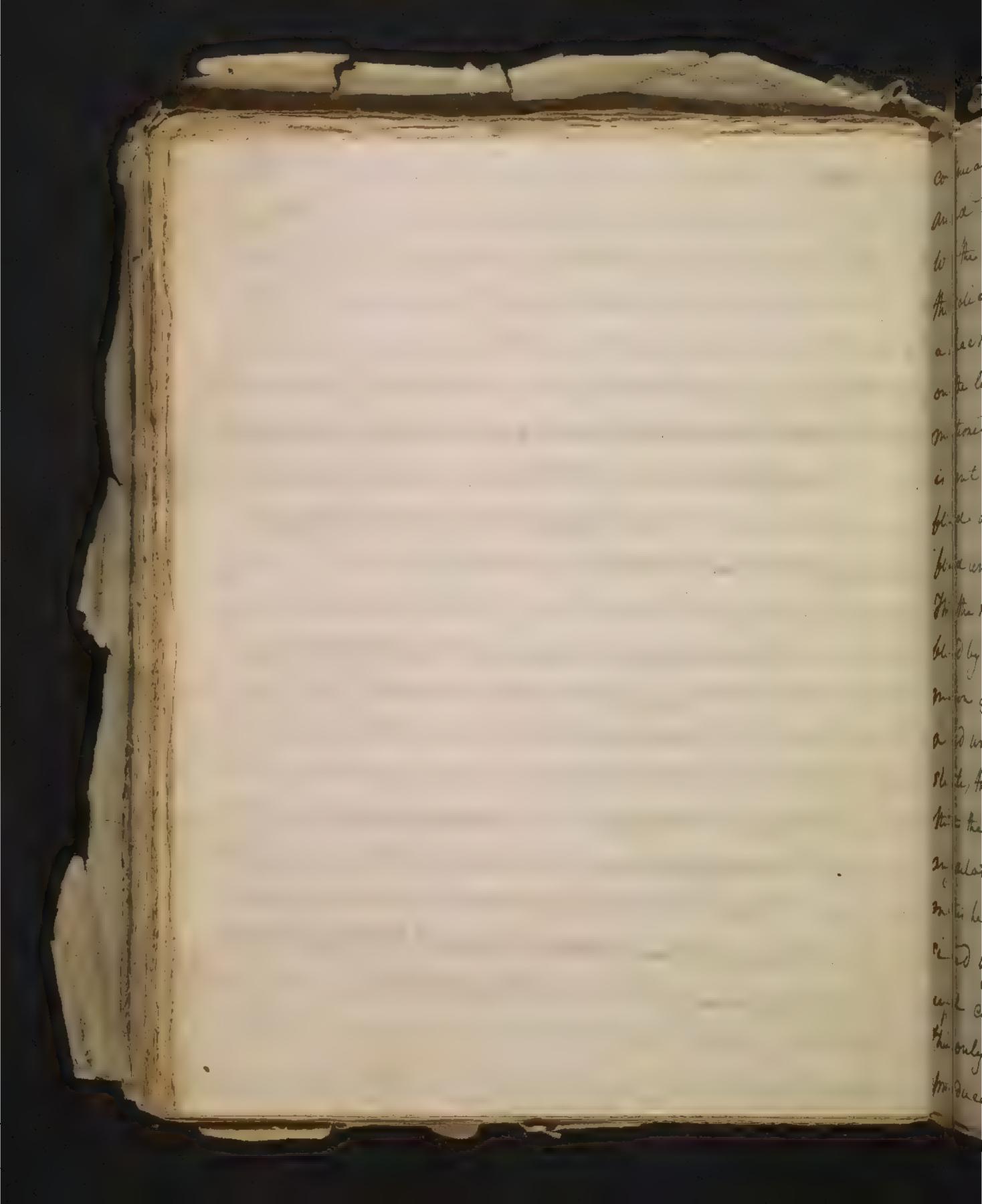
But if the same tube be filed, and each end be covered with a piece of hather, a blove or shock given to one of there pieces of leather, will be felt in the some exappearant instant, by the finger applied to the other. none this ex hibits and illustrates the vitration or undulu two of the parlicles of the fluid, for in matity each par tiele of the fluid does go forward and neturn thro' an infinitely somale space, ma this betration him som = times a on to the end of the tule day there, by the forward motion it gives to the last strutum of particly uniforthe finger with the pulse that infett. - the it is the that fluides when action on prep in all directions yet in this care if the tube be regice or undilatable there will be no lateral vibration, for since all bi: h bration requires space, and since no bleval space is le offorded by the permanent acameter of the tubes, it Solony that the longitudinal vibration or undulation is the only one that can take place or he fitt in the take - how the there vibrations are positively more: ments the space, yet the spaces are so small or the in the misale of the tube or that are funde that are funde of the tube or that are

Nor let the leather be taken from the extre mity, the partiely at the ena of the tube has ving nothing that they may impact their no Mark Hu last

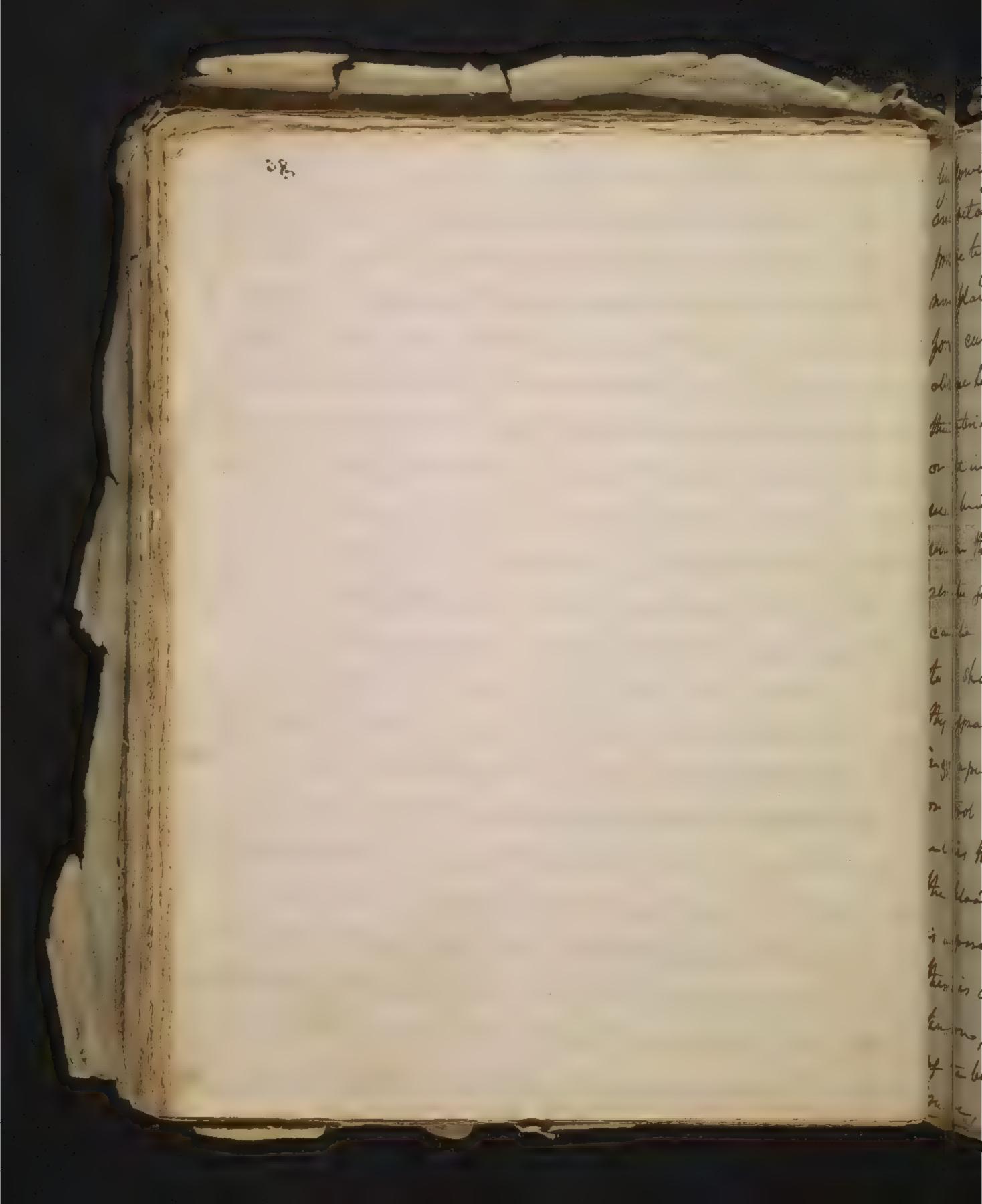
place removed, the son wining particly he at any lafter to the their the will now be carried off from the most with a weekle welocity. the same would take place if the side of the Tigia tube which allawed no lateral vibration were to be opened, for space being their afforded for a lateral vibration the partiety at the specture wil he earried of with a visible sulveity. - a familian ellustration of this may be given you by the action of a series of every bally . If any mumber of there he sus pended in ovatact in a line, and the fint be struck the last well in the same appearant moment sly of with a unible wheity, whilst all the intermediate ones wile semain appearantly at sest, the it is certain they have papeled all the motion the lasts exhibit, but for so short a time or not to alcow a verilee belo city. - To apply there remarks to the circulations. Lit us suppose the heart and blood bufuly fells una that the left wentriete contracts, two owneys of blood well thus be ariven with the corta, the artines being univielding tuber, at least them

Vo and all the intermediate quantities of fluid will be wet mane forward with a welatity inversely pro: hor since portional to the capacity of the while the which it flowers . -

being or ditutalise by this blood thrown in the mo of the blood in the artirity and vieny will theat of The solid column spoken of before, that is when the two armers are adved to the arteries by the ven tricte, two aunces will at the same appearant line be discharged from the seing into the right ausice paros since the watery and the being the heart pare may the sume eapacity, if we supporte two assert of blows to papine and accupy four we show of the arting four in eles of the vera cana with he emple of in the some times, and the portion of the supply between the two extremes, will be passed one in time, proportioned to the energie of the areas of the supplement they als = month the compelant, thus if was support the oney of othe capitain to be to the contrary 50 to be which is the least it can be then in the same time that the major best in the sorter or being poping on prinches, that in the capilaries wile performent the twelvethe part of on inches This motion of the solid or Continuous column of The blood by which it is made to change etyplace



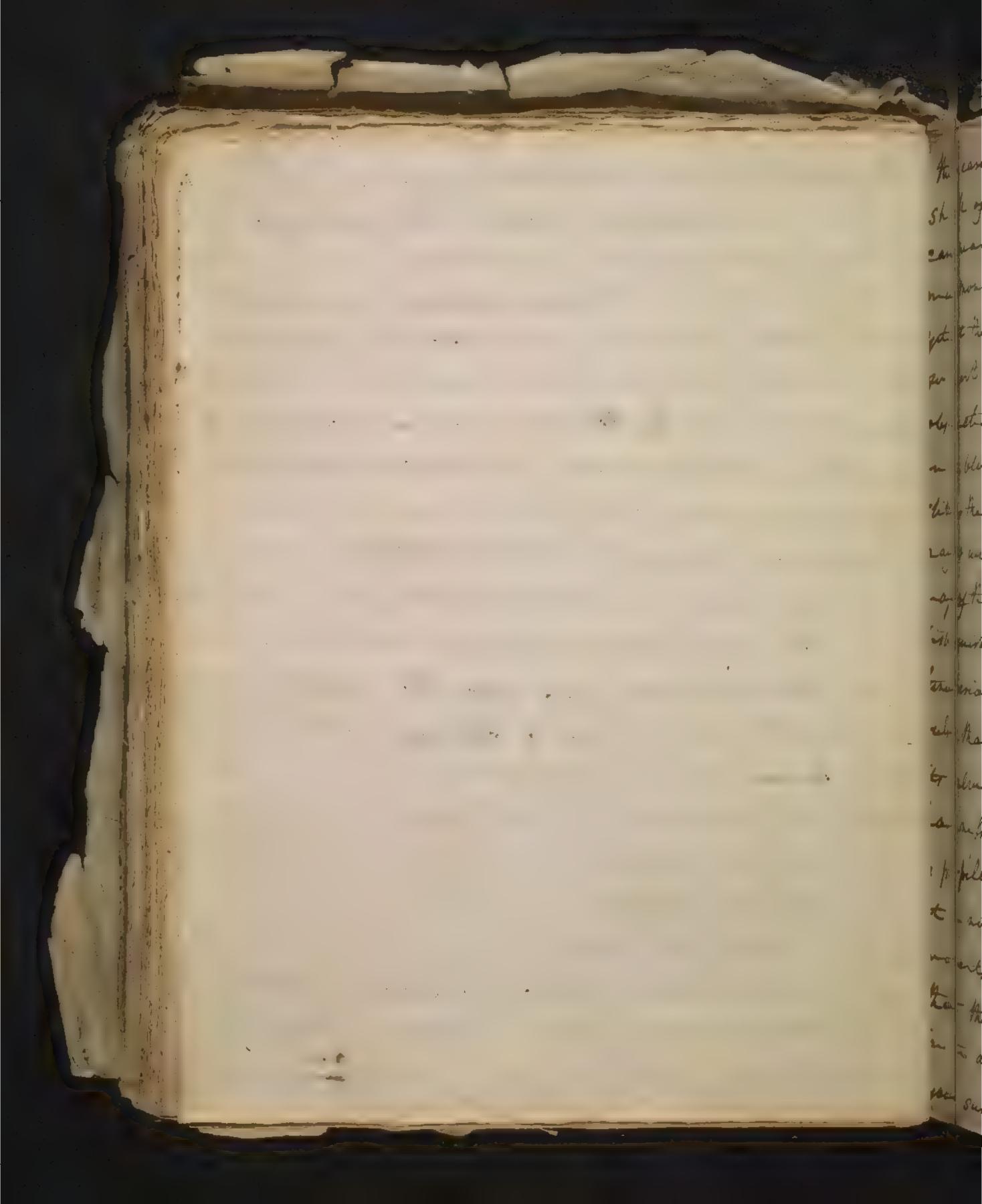
continually in the supels, is not the only effect proanced upon the major of blood by the hearts, When the bentriele contracts forcibly on its contained low The solion sions of the caucity of the ventrictes imparts a shack to the blood, which like the blow infrafind on the leather in the instance of the tube above mentioned, courses a vibration or undutations that is sent out instantaneously to ale posts of the bluide, aiminusting however as is the care with all bluid undulations, in proportion to its eatent. -Thus the heart producer two manifest effet, on the blood by it, contraction, first a comparituely olow motion of the whole map, and man immeasurably aufid undulation. - It is the last of three that com stitute, the arterial Pulse, I have already proved to you that the thob or pulse of the artiries is not produced by any aclatation of the side of the unfect, It only remains on this head to enquire if the Pulse may not be acca: scored by the progress of the map of blood along the supel contradistingueshed from the rapide undutation. The only manner in which the map of blood could produce the sansation of a throb or pulse would be



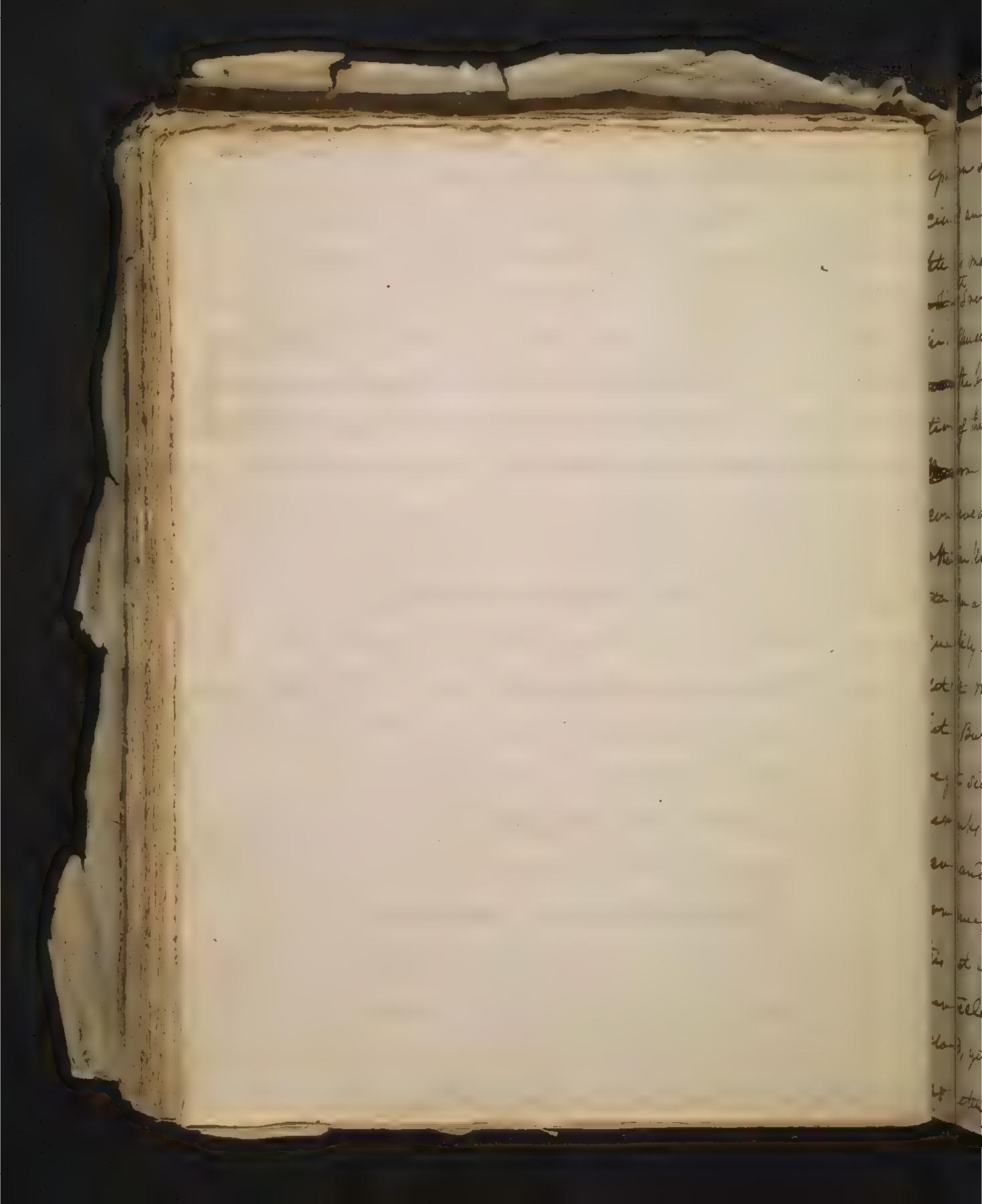
by flowing by jets or by an allemality enereared and retained belocity, the beful. But I shall proved to you presently that the Was of blood does not plane in this manner, but in rearly as uni form current us it does in the viery - Swile only observe here that if the map of Wood moved by jets in the artiries the same species of motion moved be sun or felt in the veing for the blood on the arline, and viery being one continuary column, and that two mo ving on the same circle, the kind of motion in one must also be found in the other. wethant contrary reason can be shown . have this contrary reason in figures to be shown in the increasing area of the arteries as they approach the veing - for it is said the blood flow ing napidly in the large uply, it producer there a blow or Amol which is felt as the pulse, but in the smallen anteries the velocity is so much aimenished as to prevent The blood producing any sensible implimes - This idea is approve a by the plan omena of aneurismy for here There is an increase of the area of the uppel by the tensions, and consequently a neauction of the belock of the blued, and yet we know that the throb or melve, so for from being obliberated on lipered

Vi again, if it is the velocity of the blood that cause the sonsation of the pulse, how aus et happen, that when an actory is completely at will brushed by a ligation, the there is a presention find and an encreased one los, just behind the light to the ature, where by the very condition of the party, there can be no telecity of the blood. -

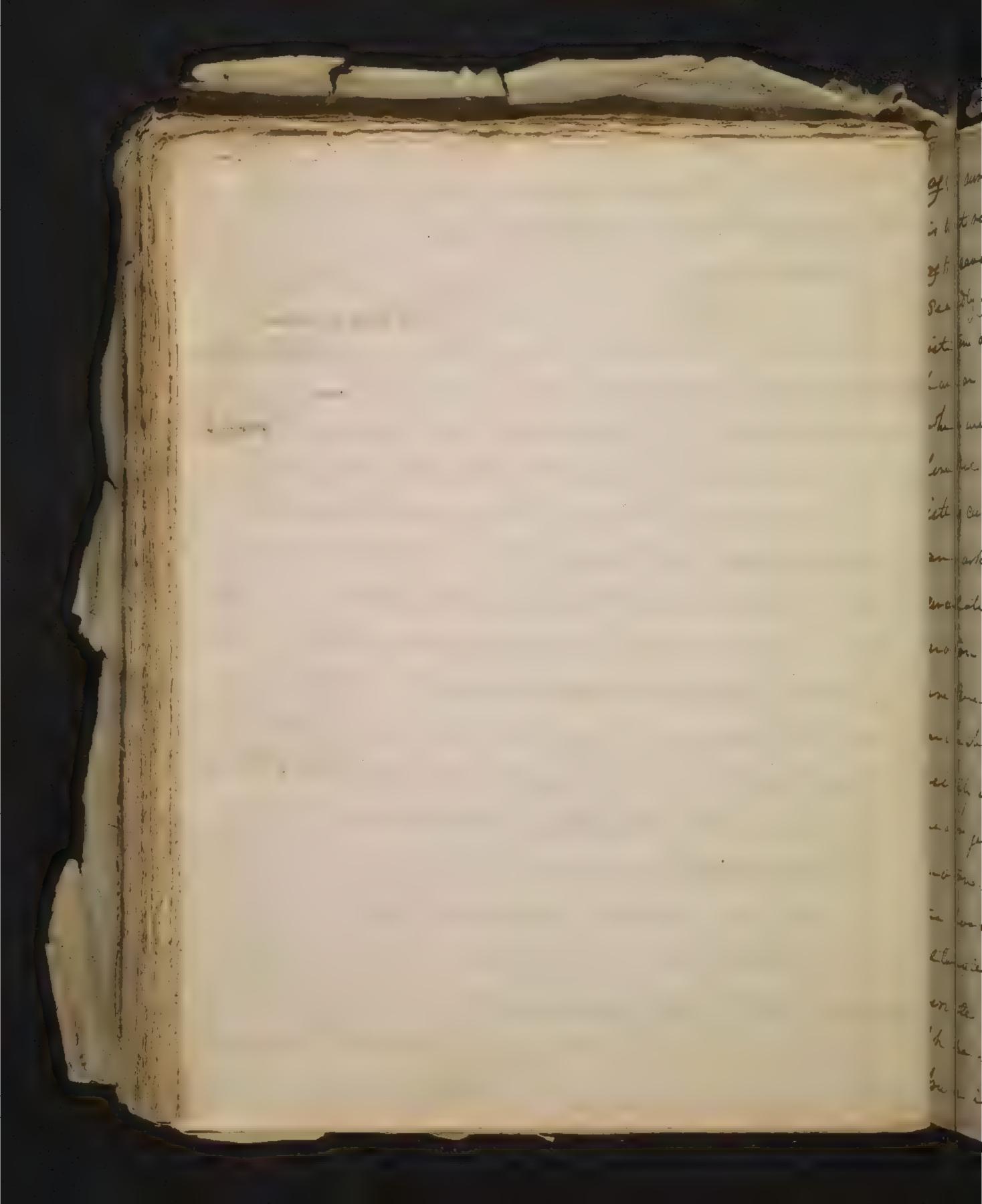
in the sack of an aneusism, is grescraly much eneroused in its force byon a the pulse of the Smaller acting leading alto et - This fact is une thely consistant with the principle of the undulation have laise down for if the pulse he produced by the napier flight of this undulations from the side of the ventricle to the lapitaries, on perhaps beyond them where it are manage thome I say it will pass with equal vlacity when the space of before thro' which to mover be contracted or enlargedand in some enlarged party of the soule of an an ausism, the undulation spreading in all directions Amo its continty, will give from the greaten bulls of Unia sat in motion, a strongen supare on in sear being prefied. - But further that it is not the belacity monely of the map of black paping under the finger that creates the pulse that is felt is evident from This, when it beats 130 to 60 in a minute it is certain the wholity is about its greatest, and you every practioner Unawy that there rapice pulses are seldam strong The strongest are generally when the palae is from 50. to go when the flood is at it, bast unlocity for it is un Commence that the state of the



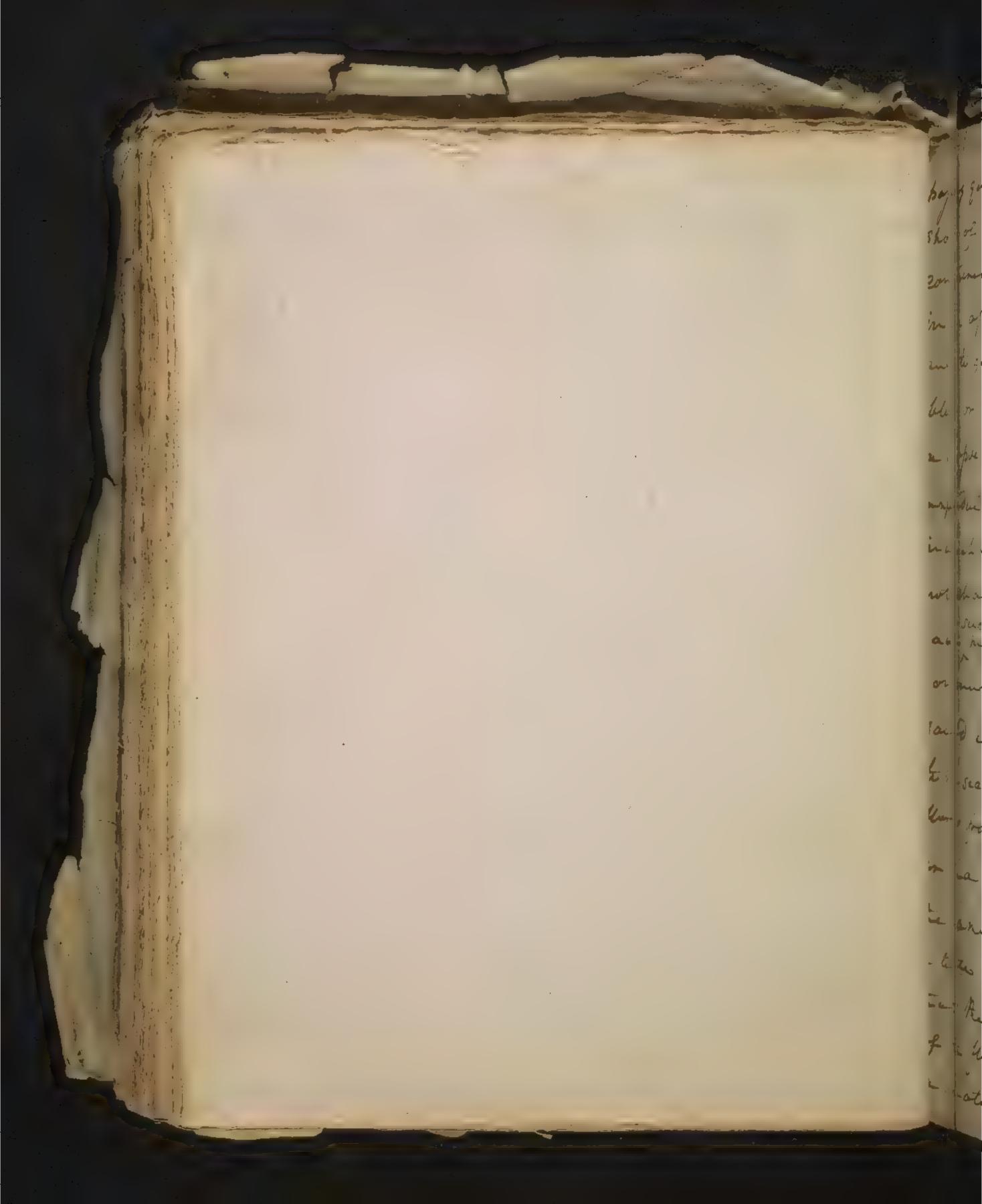
there cares, that the rule is often left as if it were the shoot of a solich hody concained in the vefely for you can madily understand that the whole map of the blood may more sluwly from abstruction comewhere wisting, and yet at the same time that the heart may make a strong gor exects on its contained blood in consequence of this obstruction - how it is this strong off sto or juste of the head on the blood, that sends and the undulation that and ditue, the pulse even the the whole may move very little may so widely may there two motions in the artery of the map of the blood, and the rapide undulation sent with, is tistinguished four each other, that I hape at some for time period to show you when he ating of the diseased Julie, that in some of those affections of the heart and its balrus where the pulse has its greatest fulness and handrey and resistance, the before map of the blood a propella with a more creeping progrep, if indeed it be not on some accasions be brought for a few moments altage them to a pauce. - Saputia alwase that the blood moved in rearly as uniform a current in the activity as in the being - I have articipated your surpoise, of not your immediate negatives, on an



opinion so directly opposed to a aretime universally re cieved and which on far as I can beam has neven the this moment been even questioned . - Savoned above that some give wo defends aspect I say the such as in a Shiel of one continued line or column as at the comme tion of the second half of that column is derived and from the motion of therfirst - I say it is at tage there in concieve able that the motions should not resemble and other in Kind - Ha certain quantity is added at one and den aqual portion munt pap off at the other and if the quantity be assed to the Sint portions of the asstanley a jet, it must the off from the cave at the other end in a get - But it ares not fly of from the cava into the right side of the heart in a get, or may be made by two permany - First from these being no value activem the sava and the anniele, the cava having file at the anniele continuer state to propel its blood into the auricle, whelst this last is propelling its contents with the now delating ventricle. - for the the auricle does propositionally on its blood, yet the warmen of the wentricles soliciting and as nothing its eary flow in that direction, the propure



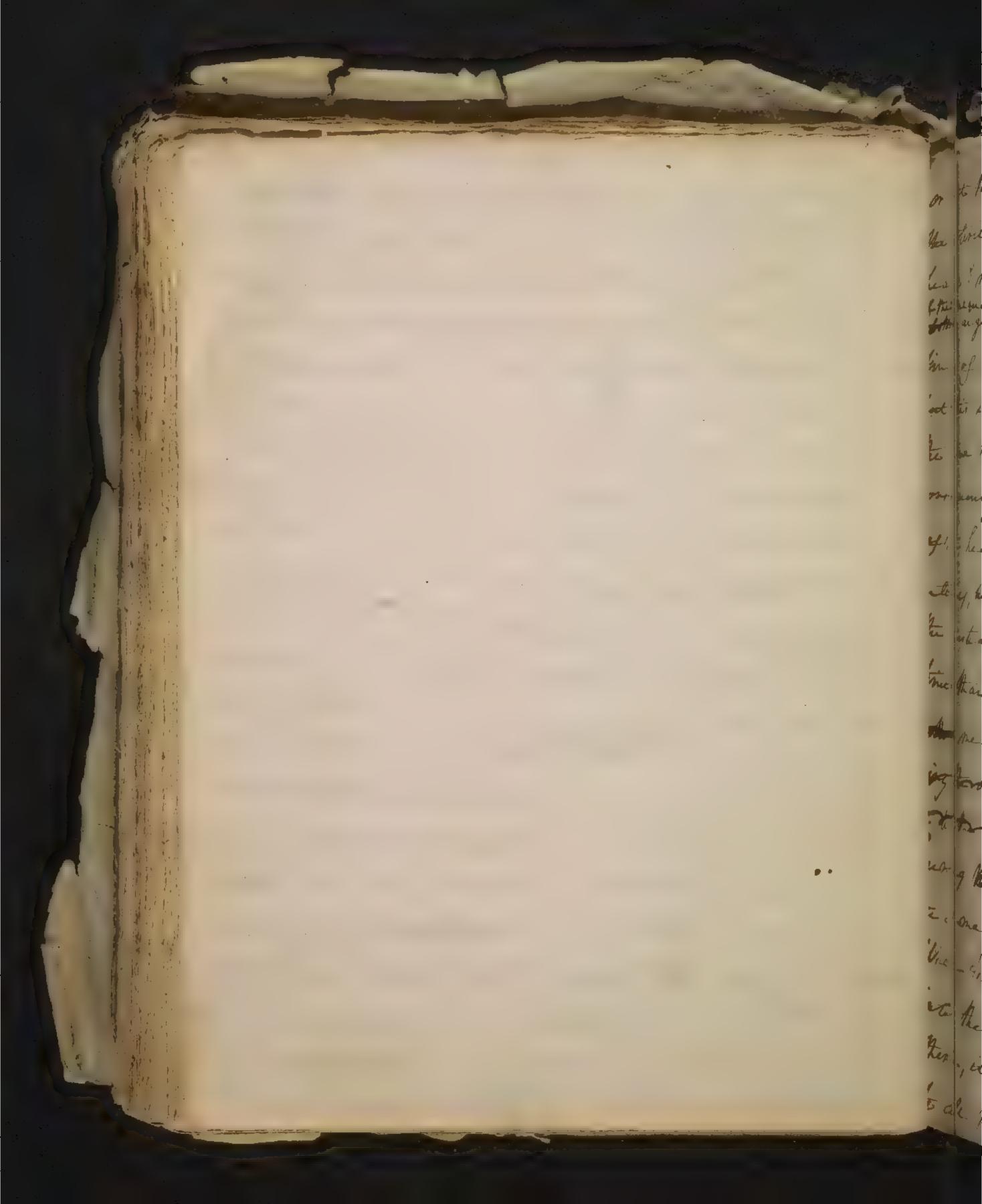
of the auricle must que it a velocity in the way it. is hast resisted so that a dight momentum of the blood of the cava will continually cong it into the aunicles. -Secondly if the blood of the cana water airch anged by a jet them ale the blood of the view whind it must also have an alternate betaidation and accollemation Such we know is not the case. I down alway There fore that the black in the activity does not move by a jetting current. I But Swill go butter with this quastion and ask for what facts in the phenomena of the consulations, this supposed alternale quick and slow motion of the bland in the arterity is infered, - They one there. The surration of a jirk or pulse in the arting in whe she it is sain the current paper with a greater. belo city under the forger . 2.9. The alternate for them and he aren get on the division of an arting 39. The alternate motion soin to be seen in the capillaris, and 4 " otrom the blood being ariven into the arling by the heart, in etternate questes, it is infered that the same questing must servate the arrivable everne. - In answer to the list I hape I have shown you that the thook but in the pulsa is not moduced, by the maps of blood in the vapel



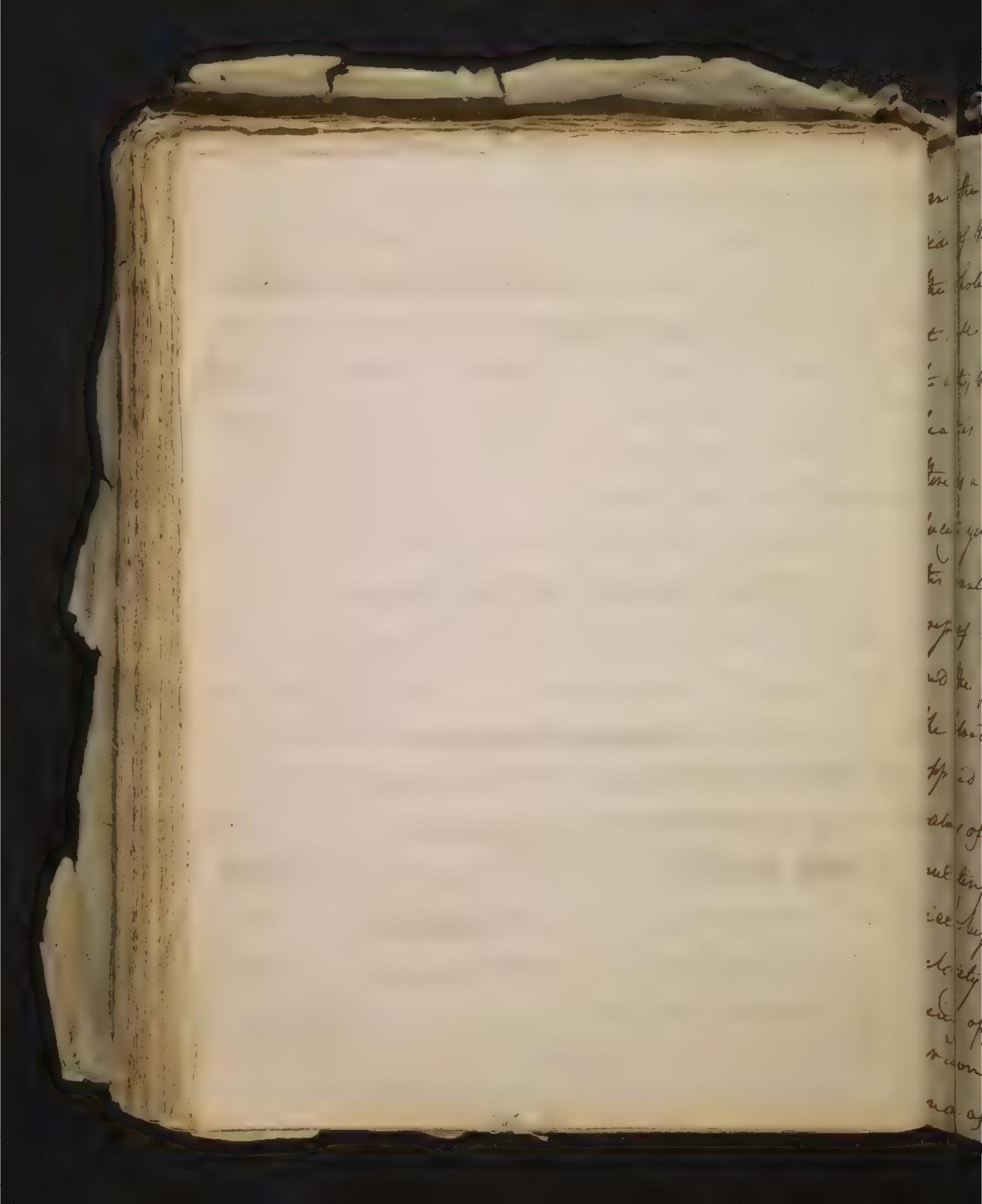
passing quickly under the singer, but by the bean on shock of the sides of the heart on the surface of its contained blood, senaing aut am undulations that in an appearant instant spread the system. und to give you a familian ellustration, just as, the blum or shade quen to one side of the abdomen of a dropse a al patient, communicales in an instant anjundulation or pulse to the hand applied to the other in which care it is acritain the maps of the fluid has in sucception thro whentely small spaces, and they communicated the supeting or sharete precionly as Sound is conmunicated the the sin - With regard to the season a fact it is thought that with blood flower from a cut attry, with an atternating quel er and slower leap, the it must receparily have The same variable motion to their the upper, but a title reflection on the Whenomena will track us that the inference is not just. From what I have said of the Muia unaulations, you have understood, it is a mation of the partiely, communicated to the part

If then pour the greater of the two gets exhibited the unaulation, and where the hard shows shown hot to en the exist in the nepel, it will mean in these importers to an equality -

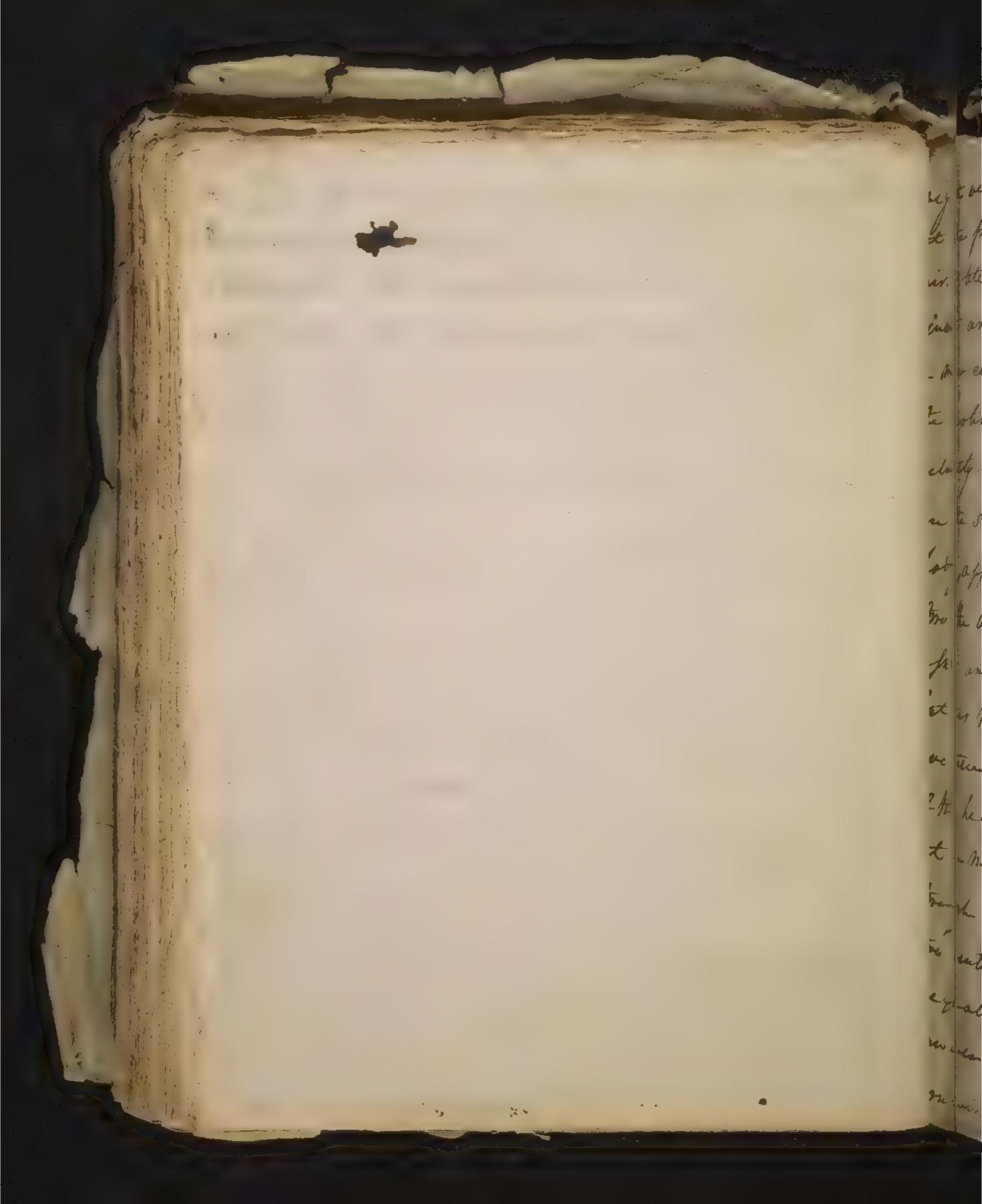
ictes before them, just as motions proper through a sories of wong bally and as in the line - of hall this that lane others before them, remain station ang, when on the last one having none before it in which it. wour of motion lies of with a visible velveily, so The undulation in the blood when it's arriver at The fast bottomicles, in the end of the division uple, causes There particles to fly of with a sensiteta melacity, has had the continuety of the column of fluid have fre. served, there some particles would unemily have gumen their motion to those before them -i'le unequal motion. when a unfel is cut by no meany proves the same unaqual motion existing in the intire befolo, Whom the thing paint. That the jet or une qual mo tion has been seem in the capilaries I have to an "I wen that no such mations can be distinguished by the nakul eye on the ipue of blood from divided e a fricarios, and if it be percioused by the microscope. In ix: ment be form a faint undulation maaking there it supply - and from a magnifying of the motion as well us the buth of theme particly which otherwise we have been unisible. - Woon the fourth point



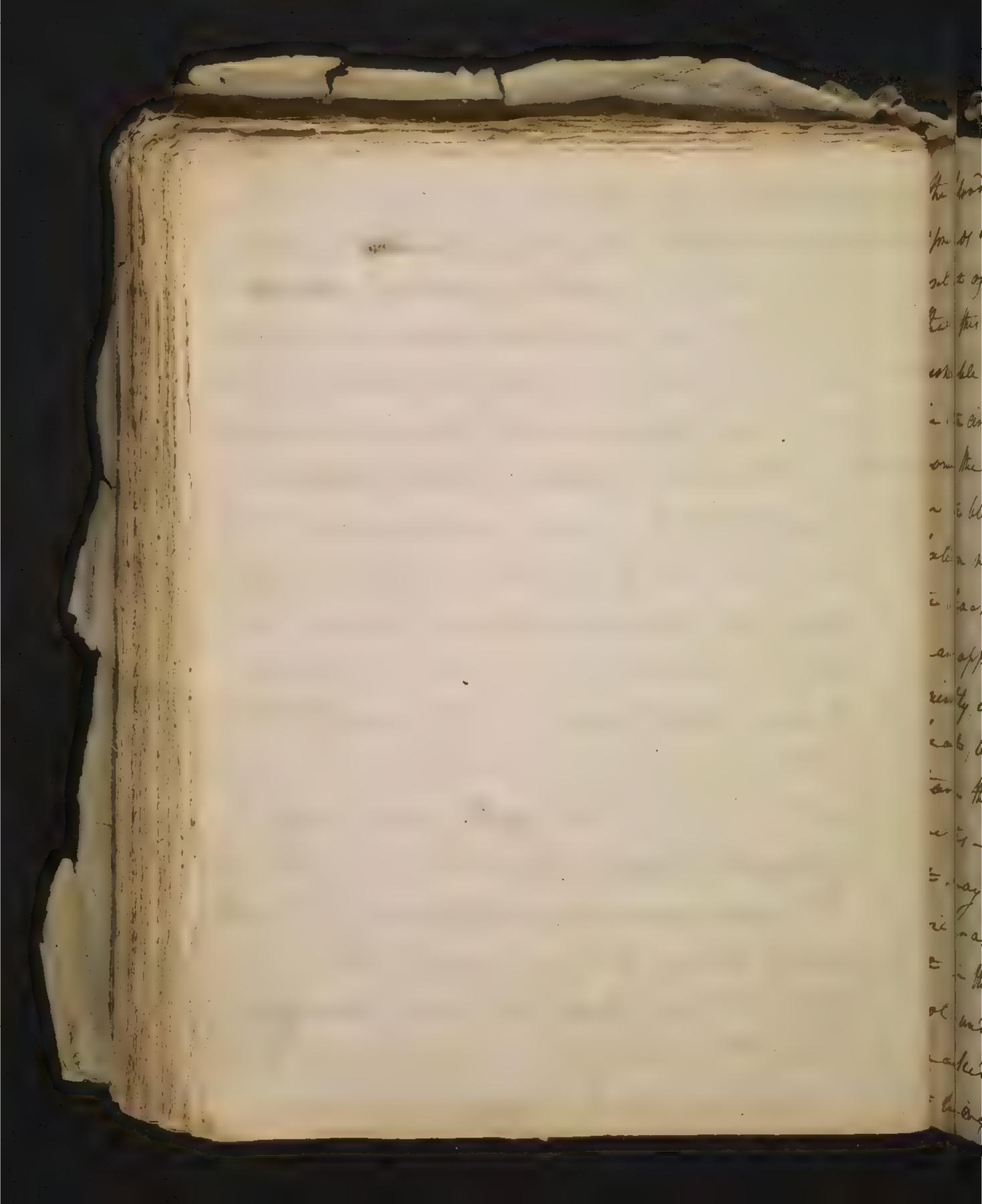
or that the blood moves unequality on lig jity through the arteries he cause it moves unequally from the cause heart he taken as the cause of they wreened from the formation would of they wreened from the formation argument to the total would of one that the Konds of motion should wantly resemble each other hat this is not the case since for more than halfe The time there is no discharge of blood from the heart, consequently at that time or auxing the empansion afthe heart there wants be no motion. Amo the The question being only whether it is quester at one time than another, at semainer to be shown by what comments, it is not only consider and willen the significant fage of the per of the heart, which is known musing know steppen of the heart affects with mind The same welacity or during the little contraction in When the east project, it two anner of blood it ente the sorta with its terown great velocity there, it communicates the same momentum to all parts of the column of blood tutureen it



ma the bernination of the case at the seglet ride of the liaster. But it is known to you that the whole mays of blood Lawing this momentum it will not be laft the moment the heart class to act; but will carry on the blood when the heart is at best ... But you will say that the There is a motion. of the black from the acquired he weety yet this motion is diminishing - I am wer that this would be the case if the rejistance to the progref of the blood were the same during the action and the pause of the heart, But the is different The blood sent on by the action of the heart, is opposed at the other end of the column by the cloud values of the right bentriele, and by the map acen mulating with considerable agestance in the au viele before it - The blood sent on by the acquired belacity aftering the power of the heart, so far for being opposed by there rejestances, is solicited on drawn on by the vacuum formed at the other "y ena of the comme by the distation of the



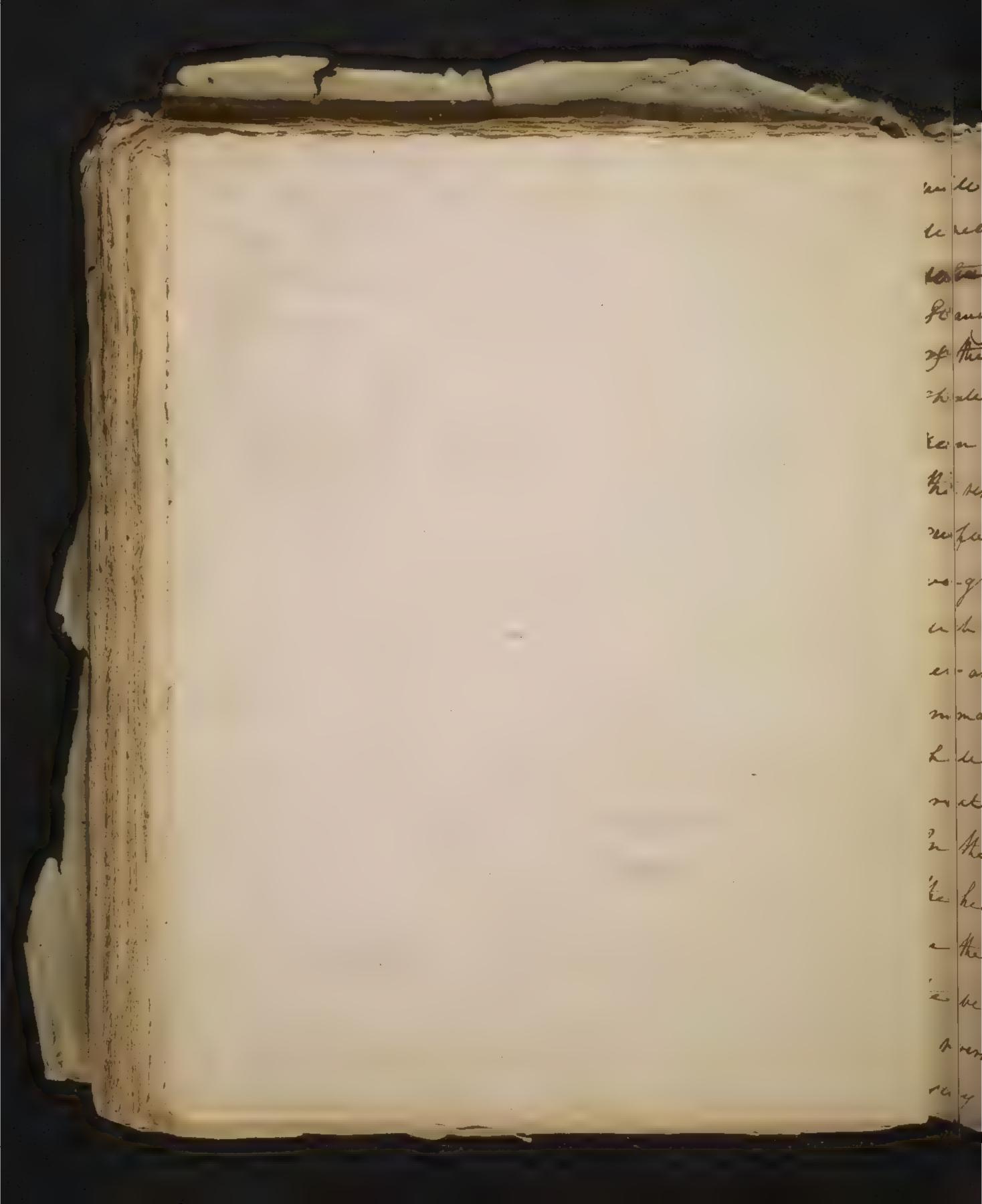
right venticele. Thus is the welocity acquered at the pause of the heart, and undernie: surho, tite the felling of the ventricle some be find to anest it; but at that some moments a new contonation of the left verticity, wives the motion and their gives piece to one unwavied belocity in the same masoning here employed it on the subject of the larger circulation the hady, applies equally to the motion of the blood The the lungs, for the same relative farction of uply and of penticle and ouriele exists here. tot us then he capitulate in a few word the anchier that has been delivered. - By the action of the heart alone the blood of the whole body is but in motion, the motion their produced is egrable 5 through the entire curent of activity and very, the me quality on jet exists at the same moment havever that the heart gives its supulse to the continue blood, a shack is given by it sidy to



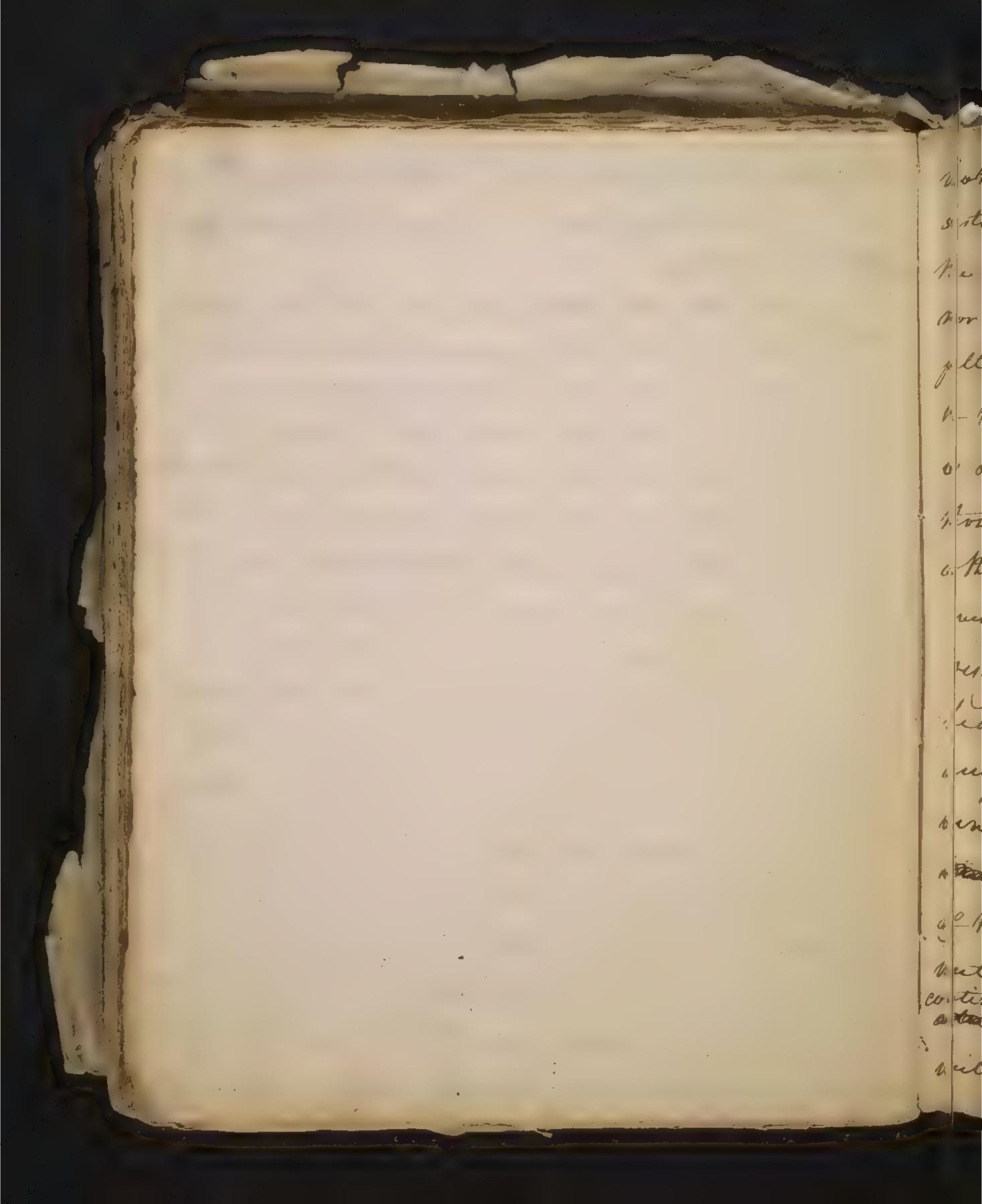
the blood that souds out an undulation thish Spread in an appearant betaut the a cirtain inline of the differ - for your are to recollect that the undulatory impeter is in it, noture pe sushable often a certain extent, as may be sun he the circles that form on the surface of waters from the shock of a stone cast into it. . Now In the blood wefole, the extent to which this unda lation resher will measured by the force of the shack given by the heart, In those cures of near approach to death where the heart beats faintly, at is often manifest un the unfuly bean the heart, but lost in the entremeter, tho it is een town the blooder state flowers thro there extre metries - lagain whem the heart heat, strongly It may be ach inte and wen legand the capill anis. - as objection has premently actected the m jot en the effer of blood from the being of the it foot, under assumptances, of Mittantin has he = markers, that did not allow the possibility of its being caused by the pulsation of any contiguous

Volunt which gives no sensible velocity to the blowd this which it moves the 200

The same of the sa artery - The whole motion of the blood has there two aspects, one uniform progress of the entires map round the circle from the left to the sight hentricle, and superadded to this, an atternate whoul stion that rapidly autstrips this current and dies away in the capilaries. It is the lange trainal flight with were af their undulation, there is ques the impression of the pulse when the finger is meford upon the artery . - and ot is the same implifie that meeting with the opposition of the curvature or branching of upply, gives size to The locomotion or change of position of the whole artery that has so long been mustakengon the dilatation and contractions of its side for you are to understant that the sides of a stragter arting being paralale with the direction of flights of this undulation, no impulse will be fetton slightly touching the bane arting, not the moment the seas are prefito m, or a curvature opposes That paralelism is austraged, and the sides lung now opposed to the track of that undulation The same of the sa



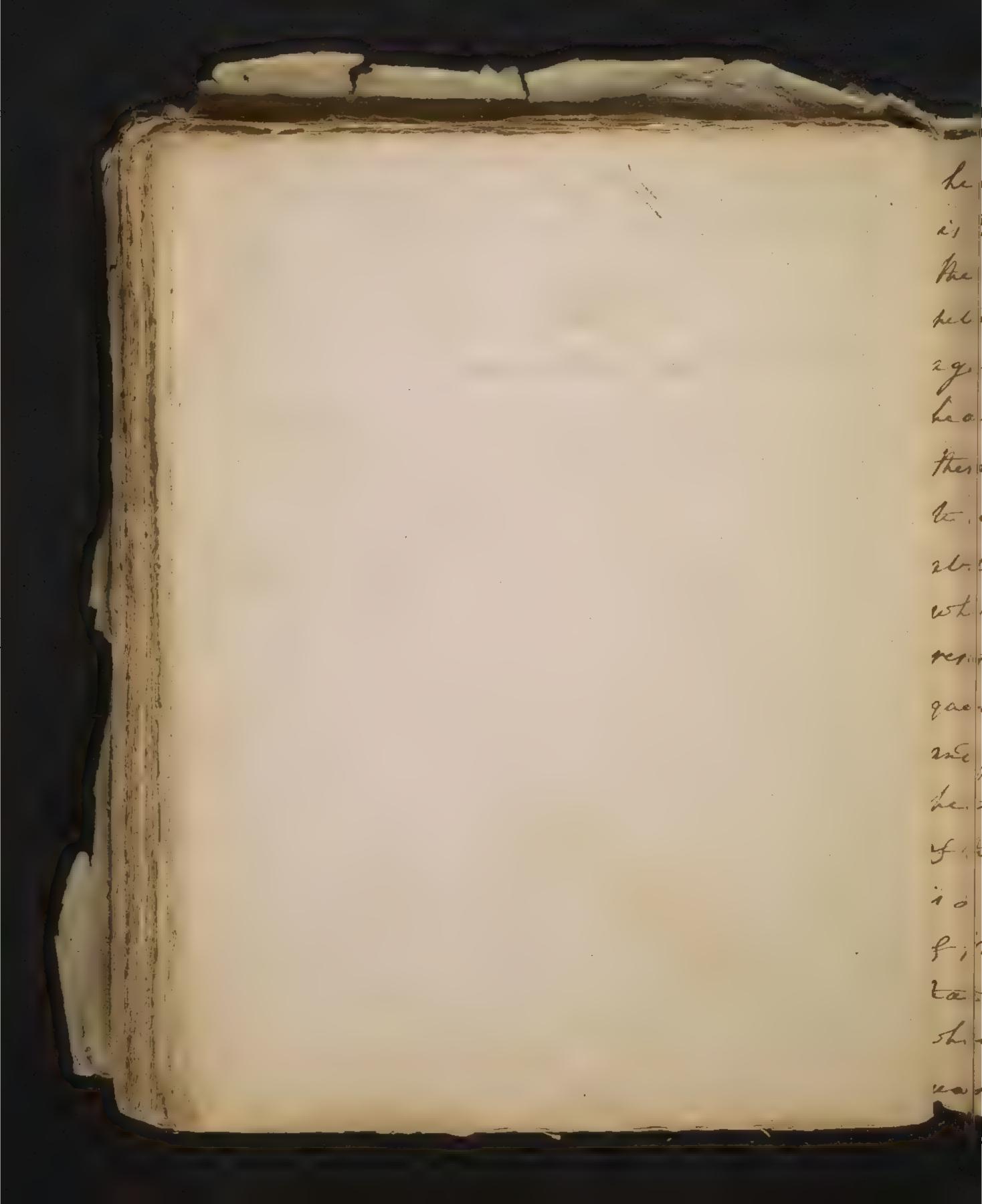
will feel a shock or pulse proportional to the direct apposition that is made lig such prof; Wester ou curue . -Having on the precuding wiew ascribed the motions of the blood to the sole agency of the heart of Shale here answer the alycation that has always Deen made to this opinions, It is unged that The resistance from the friction of the blood on the surfuse of the innumerable wefrely, and from the way to of the map of blood itself to be moved, as such that the power of the heart alone would her. wer overcome it - In estimating the probables ammaunt of the resistance from them couses. S shale consider the human hady, in dy two defarent states of an event and recumbants position In the enet postwe the blood in all the part, above The heart is moved against the influence of gravity in the activity, and in its direction accomains thro the being - In the party believe the heart this order is severed by its asserding the the actives and society in the veing button A STATE OF THE PARTY OF THE PAR



hatt above and below there is a simular se : sustance from frection. But in the party action The Least, mitten the sexistance from freetons nor the gravitation of the blood in the busy, is felt or the the avercome by the heart. - Hor smee In there party, the blood on the arteries and being is one contituous column, the way to blood in Those two sets of hefsels would belone each other if the luley in which they are contained were of equal highty, but the action as tubes sering higher than the intrance of the cauca to the heart, and that him you be completed to the bunght of the arterial will exceed that of the benous stim, consequently there will be a an towards sintering of the first and a desurg of the last to mantain the equilibrium continually filice by blood from the heart, there will be a continual riging of the column

Atran I upon the principle Leve laid down, we may Su a cause of the easy progress of the blood And The the lengthined, and appearantly obstain toill ting circulation of the lives . -1.20 a. a Zim a in

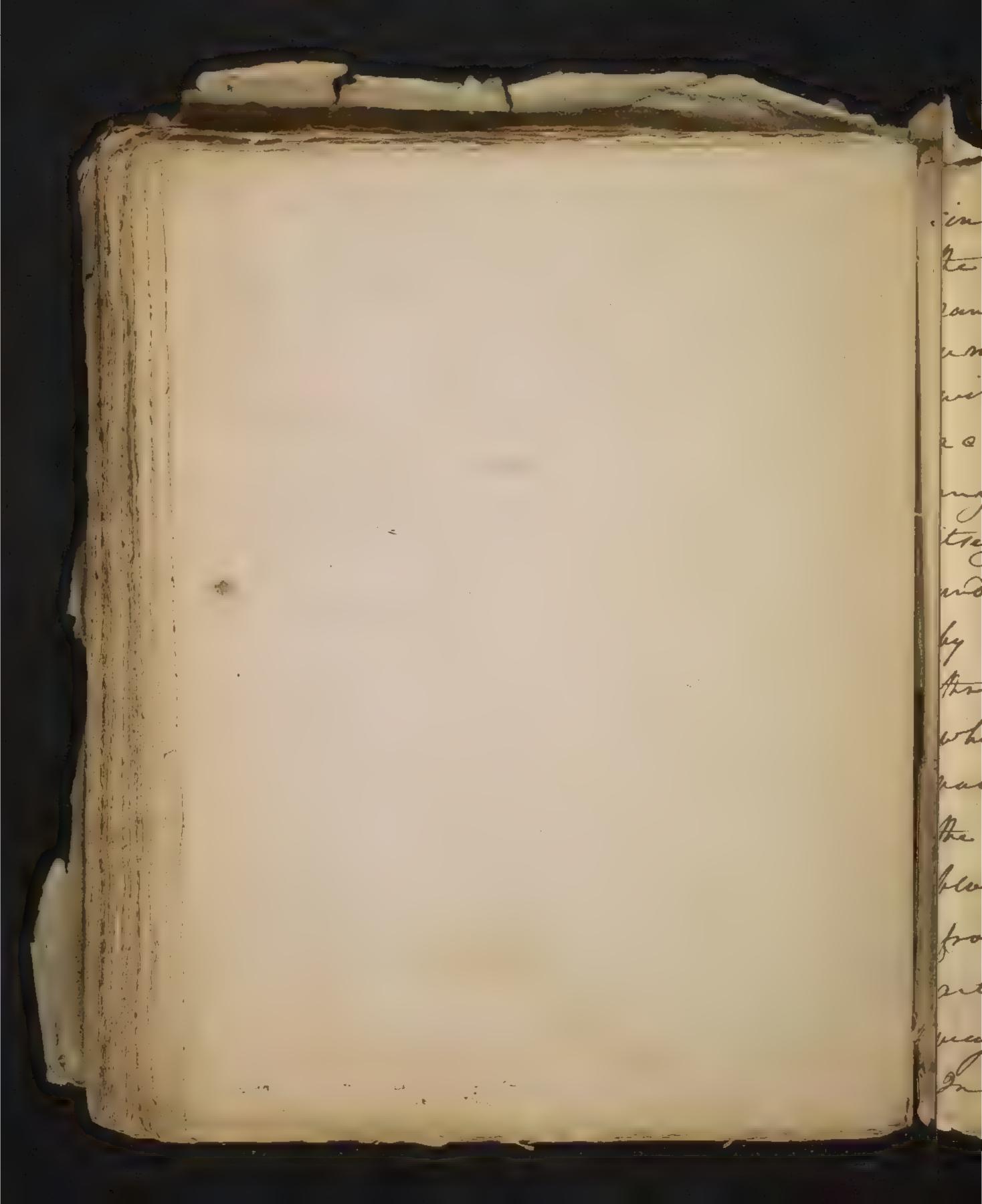
In the vient simply from the greater wing to of the arterial column. So that the august of The Island and the sepatance of its priction are both over come in these inferior parts, by gra sety alone, with no further air from the heart may than its constantly keeping the higher por = tion of the arterial stem fules. In the exect parture therefore the greatest labour of the heart will be to proper the blood against the gravity thro the activity of the superior parts of the body and to avereone the sujestance of priction there Hence we find those animals whose heads are always or usually carried exect, have the heart placed mean it, whilst those in whome the head is on the hongouton line, or below the have the heart scated heren the whole length of body. - In the recumbert parties of the human boog. The six that gravity had given on over coming the friction of the blood in the parts below the heart mon econer, and the whole of this rejectance is thown up on the



heart, But it will be seen that the thank is thus hurdened with a new obstruction in The recumberat posters, it is at the same time petimed from the labour of sursing the blood against ett granity to all the party above the he art - the it still hap to consumber its facilion there . - as in this position there is lette or no grands to sucreome it appears that priction above is the abstacle to the recumberat circulation, and whether this or the exect position offers most rejection as the the heart resolver itself into the question whether the secretainer of the gravity and frection of the blood sent to the pats above the heat, he greater or less that the friction alone is I believe one of the outs of the guestions of Physiology, but it would seem probable That the peristance of piction the ant the whole body son the recumberet sejestance was the greatest, and that probably from

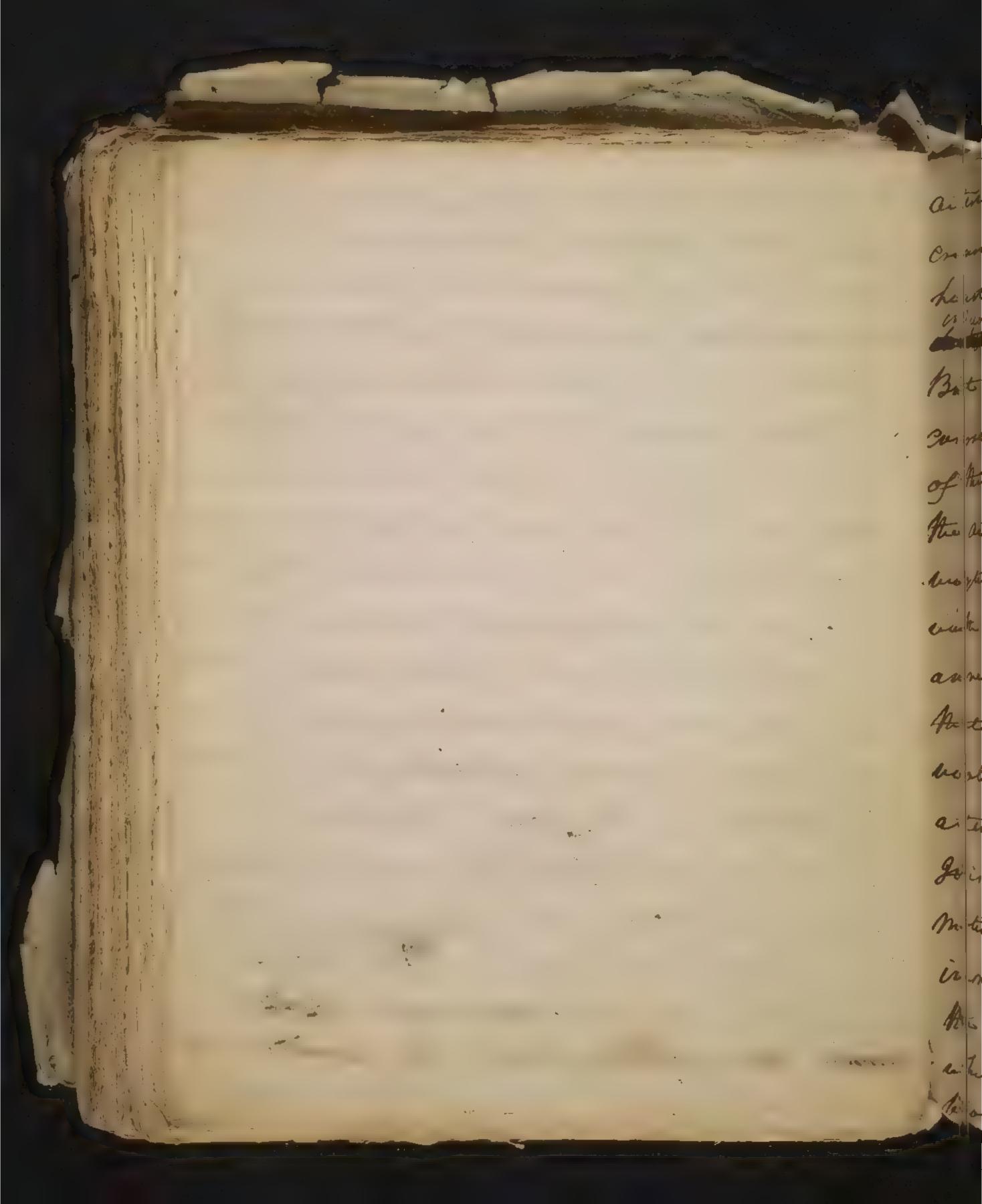
So It appears then that the friction of the blood han on the heply is the preneplal if not the greatest of m resultance to the action of the heart. and the hund question is whether the heart is able to over come of et, how there oxist no elements on which a precio late calculation can be fromed, of the power of the of he art and the might of this resistance, it is he un profibe therefore to make a street composison of between them - or to found a pragment immedialignost upon them, they must then be micetie from the aste en gument, and their belationship sanget by more the Colealeral means. - now since the beaut and ungit ort a force in conculating the blood - and since or gold other cooperating cause or cause have over been as shown, the inference in the present state of an a to · Knowledge must be answer that the heart time alone is sufficient for that circulation - stor

this care arriver the full and slower foulter, and The frequently aly bucted arealations of the and posigoulat position and of sleep. - The defeat tutof murcular exertion & shall show unmideales Lup no past in Rat attration. one Hom the view of have just given of the grave in lating influence of the two vajenlar columns of bland in aiding the motion of that flied tis in an exect posture, we come to the knowledge ion of the values that one placed throughout the oly greater point of the wins . - The value, home an been supposed to aid in the ourculation of me the blood, by relieving the pressure of the column ea of blood in the viery, by proventing a requir no gelation, on any objetou ation laking place, or en as they are found in most abundance un the entermeting they were supported to have an in timate reference to the action of the Mus: - der upan the vient - But there aresiled unes mui be rejected upon an moestigations, Hor



Some the blood flawy uniformly in the being the walnes ment be always open and Lenea can appose nothing to the weight of the col ermen of black. - nor can they wen be closed without producing an objetuetion and an a acumulation whind which if it wateres any length of times will be back at to the host etrely - hor is any thing gains by their preserve under muscalan action. - When a sice is propo by a muscle the bload is anested in els papage Atro et, an accumulation takes place whend which wile be the same whether there be so values or whether they be man merelete, for The accumulation takes place not from the blood profit backward by the nurch, but from the Just obcames arriving from the arteries. and the presence of values can in the very atter the impatery or quantity of there -In ander to make you sensible of the unetvi The importing of

of the walnes it is meastrang to neces the the fact that when the hoog is exect, the blood on the activity and sing forms two-up might columny communicating to below -It is plain to you that of there columns of fluice have correcterables weight and Motitity y a shack is given to the body he a westical arrection, an impetus must be communicated It those columny which will cause them to mels on soone in that direction with a fores. proportioned to the degree of the shock - Ithen There were no walvey in the veing, and are supetus were given by surving leaping or any bear treat motion of the bady the ordinary and regular current of the along weuned be broken and impedial by the powerful play of the motion of these columns . - But the column of price in the very from the set of the in as its decent will be against that of the



arterial column and this but being on : creand by the acception of more blood from the heart, an accumulation would take place injurious lette to its motion and structures -But let en suppose value to be placed in the course of the venous column and the implus of this column wile be distroyed, while that of The arteries remaining, and far excuding the Muse wight of the other, the blood will be ariven on with an accelerated velocity up the usual ch annel of the viery - and this is the may on that running baping, and other succepture bealent shocks given to the bady are always attended with an energical cercutation. His commonly supposed that the muscalus motion producing there exercises is also the unmediate course of this rapid motion of the blood - But you east fails to observe that blood between the point of prepure and the host

V' the blood may elude this internal prefouse by anog to W and an external course. The circulation would be from more objetivetiel and east back in greater quanty or - " on the heart, from the arteries than the viers, if it and to were true that muscular action has that effect oneula The motion of the blood which the received throng or o Supposes. - From the view I have just given of the less are of the value, their presence in the arteries is al produ together unnecessary. -I have Their guittemen indeavoured to set before heron you what I will not cale a throng of the arculation to an for your reflections, but a display and arrangement and of its pheromera for you the test of your future ob. muste sweatern and experiment, I would not wish with So far to change the auties of pupil and trackers as merely to the orige for you, an employment 12/10 in which the master is ever inferior to the sh schallar. nor would I wolling by he guilty of the Mina high orine in science of offering to your more man not at asses at the same time netard the for Whind he from the point of purpure to the activery - so that to on the whole there could be no gain of belocity. to and this is conformable to fact, for where mus on enlar action alone takes place, or in many convulsure diseaser, the pulse is more acceliveted to the argree that those other carriers produce, it is commonly but title exceles above stand on frequency, and sometimes reduced much heren it - The walver therfore are not adapted to any use in a quies cent state of the body and were it never empored to the kind of to motion I have spoken of they woold be all = L'agether superfluour. - according to the doctiones to the proper function of the arteries as the veing for nattwith standing the arteries are more regide than the being ance capable of resenting greater propure, state this the Greaten resultance is as nothing to the straining propuse of the musely which surraund them, and since there si

genation on those points that promise un interminable difference of opinion a crime to publich other persons and times wile be sure to ajuare the motifying penalty of oblive on ... If you wish to accumulate knowlage or fame, kup your unwaried attendance en The school of algoriation and experiment. But if your must sometimes play the true auto of science, go to the subjects of the I brain, of generation, and animal life, and exercise on them the partine fancies of a fabrite. But other points of physiology that like the circulation are palpable and submetted to philasophical enquiry, amand a more many exection of intellect. famo Ruch Philadelphia Septemb /81%.

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